Drainage Inspection

Construction Inspector's Training Manual

January 2006

Washington State
Department of Transportation

Drainage Inspection

Construction Inspector's Training Manual

Washington State
Department of Transportation

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Introduction

Part 1 Introduction

Introduction

Class Information

Course Title: ***Drainage Inspection***
Date: _____
Location: _____
Instructor(s): _____
Course Code: ***ACF*** Class Number: _____

Purpose of course

The purpose of this course is to provide the novice drainage inspector with:

- an overview of proper drainage installation
- information on surveying of drainage structures
- description of the key areas of inspection
- information on collecting required material samples
- descriptions of safety procedures during the installation, inspection and testing of a drainage structure
- a summary of required documentation
- a comprehensive course manual containing outlines of the duties of an inspector and references to critical specifications.

Course Objectives

Upon completion of this course, participants will be able to:

- Identify five common drainage structures
- Read and interpret drainage staking information
- Calculate grades, flow line elevations and structure excavation for pipes
- Describe proper installation methods
- List three common environmental BMPs used for drainage installations
- Describe a “safe” trench working environment

Importance of the Drainage System

The life of a roadway depends largely on proper drainage.

Drainage systems are designed to:

- Provide passages for existing natural drainage channels,
- Collect rainfall within the Right of Way and dispose of it in natural drainage channels
- Intercept groundwater

If a drainage system is not adequately designed or is poorly constructed, damage can occur to the roadway prism, other structures in the vicinity of the project or to the surrounding environment.

Role of the Drainage Inspector

It is the responsibility of the drainage inspector to review all Contract documents regarding drainage and to be alert to any problems that may occur during construction.

Because items may be missed during the design phase of the Contract, it is a good idea to review the plans in the field, particularly during severe storms. Observing the flow of stormwater allows the inspector to identify possible future problems.

Part 2

Drainage Terms and Definitions

Part 2 Drainage Terms and Definitions

Drainage Terms and Definitions

Types of Pipe

The Contractor is permitted to select the type of culvert and drain pipe that will be installed on the project, except when the specific type of pipe is stated in the Contract Special Provisions. Some of the pipes commonly used on projects are:

Aluminum	Corrugated Aluminum Alloy (also known as corrugated metal pipe or CMP)
Concrete	Plain
	Reinforced
Steel	Zinc Coated (galvanized)
	Aluminum coated (Aluminized) corrugated iron or steel
	Protective Treatment
Structural Plate	Corrugated Steel
	Corrugated Aluminum
	Protective Treatment
Thermoplastic	Polyvinyl Chloride (PVC) solid, profile, perforated or corrugated
	Polyethylene (PE) perforated or corrugated
	High Density Polyethylene (HDPE)

Note: It is not necessary that all drain or underdrain pipe on any one project be one kind of material. However, all contiguous pipe shall be of the same kind. Standard Specification _____.

Classifications of Pipe

Conduit — Used to carry water pipes or utilities under mainline

Culvert Pipes — used to cross the mainline, 50-year design life, difficult to replace, metal culverts may require protective treatment.

Drain Pipes — Generally low cover, not used to cross mainline, 25-year design life, no protective treatment, used for private road approaches, easy to replace.

Schedule Pipes — Pipes between 12 and 48 inches inch may be classified as scheduled pipe. The term "schedule" indicates the height of fill the pipe can accommodate (see "Culvert Pipe Schedules" under Standard Specification Division 7-02 and "Storm Sewer Pipe Schedules" under Standard Specification Division 7-04 for more information). Metal pipe may require a protective treatment

Storm Sewer Pipes — Protective treatment may be required, 50-year design life, must be pressure tested.

Underdrain Pipes — always perforated, intended to intercept ground water, 25 year design life, no protective treatment.

Drainage Structures

Box culvert – A concrete box structure that drains open channels, swales, or ditches under a roadway or embankment. Typically, a culvert is not connected to a catch basin or manhole along its length.

Catch Basins – A chamber or well, usually built at the curb line of a street, for carrying surface water to a sewer or subdrain, having at its base a sediment sump designed to retain grit and detritus below the point of overflow.

Headwalls – A concrete frame poured around a beveled culvert end. It provides structural support to the culvert and eliminates the tendency for buoyancy .

Inlets – A form of connection between surface of the ground and a drain or sewer for the capturing surface and stormwater runoff.

Manholes – A hole through which one may enter a sewer, boiler, pipe, conduit, or drain.

Structural Plate Pipes — No protective treatment, may have added thickness to the metal on the bottom for abrasion.

Miscellaneous Drainage Items

Beveled End Section – End treatment which consists of cutting the end of the culvert at an angle to match the embankment slope surrounding the culvert.

Channel – Bottom width 8 feet or more, may involve outside agency permit.

Ditch – A long, narrow excavation dug in the earth for drainage, having a top width less than 10 feet at design flow. Generally, ditches are located at toe of fill, top of cut, end of pipe to Right of Way or designated drainage areas or contoured areas such as interchange quadrants.

Energy Dissipater - A means by which the total energy of flowing water is reduced, such as rock splash pads, drop manholes, concrete stilling basins or baffles, and check dams. In stormwater design, an energy dissipater is usually a mechanism that reduces velocity prior to or at discharge from an outfall in order to prevent erosion.

Flared End Section – Manufactured culvert end that provides a simple transition from culvert to streambed.

Pipe Anchors – Typically needed when pipe is to be placed above ground to hold the pipe in place.

Riprap Protection– A facing layer or protective mound of rocks placed to prevent erosion or sloughing of a structure or embankment due to flow of surface and stormwater runoff.

Risers – Spacers used to increase the height of inlets, catch basins and manholes.

Safety Bars – Used on the inlets and outlets of large culverts to allow vehicles to safely traverse recoverable slopes.

Special Ditches – Bottom width less than 8 feet, outside the roadway prism.

Trash Rack/Debris Catcher – A structural device used to prevent debris from entering a spillway or other hydraulic structure.

Drainage Definitions

Inlet – The upstream end of a pipe

Invert/Flow line - The lowest point on the inside of a sewer or other conduit.

Pipe Grade - The difference in elevation from the end of a pipe to a given point divided by the distance from the given point to the end of the pipe, calculated as a percent grade or a foot per foot measurement.

Outlet - The downstream end of the pipe or the point of water disposal from a stream, river, lake, tidewater, or artificial drain.

Stormwater - That portion of precipitation that does not naturally percolate into the ground or evaporate.

Part 3

Contract Documents

Part 3 Contract Documents

Contract Documents

Order of Precedence

Class Exercise #1: In Division 1 of the Standard Specifications you will find a listing of the Contract documents in "order of precedence." Write the documents in the blanks provided below in their order of precedence.

Standard Specification: _____

1. Addenda
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____

Supporting Manuals

Construction Manual - Provides guidance to the inspector in the requirements for Washington State transportation projects. Unless referenced in the Contract Plans, Special Provisions or Standard Specifications, this manual is not legally binding for the Contractor. Information on the duties of drainage inspectors and materials requirements will be found in Chapters 2, 7, 8 & 9, respectively.

Hydraulics Manual – Provides information for design and construction considerations. This manual is especially useful to the drainage inspector when a change is required to either an existing or planned drainage system. Any changes to be made in the field should first be reviewed and checked by the original designer of the system.

Highway Runoff Manual- Provides technical guidance for avoiding and mitigating impacts to the environment during construction. This manual also presents ways to combine or enhance different types of *Best Management Practices (BMPs)* to maximize their efficiency and for better use within the project site.

Part 4

Pre Construction

Part 4 Pre Construction

Reviewing Contract Plans

Before work begins on the project, the drainage inspector should review the Contract Plans to be familiar with drainage items being removed or installed.

Summary of Quantities Sheet- Provides a complete tabulation of all bid items and pay quantities that have been determined by the designer/design team to be required for the project. The quantities are estimates only so the actual quantities may be over or under the listed amount. Check the quantities to be sure they are reasonably accurate and that all bid items are included.

Structure Notes- Used to tabulate locations, bid items, quantities, and notes pertaining to the drainage items, utilities, water lines etc. Compare structure notes to drainage profile, drainage plan sheets and miscellaneous detail sheets to be sure all items are included.

Drainage Profile - Provides horizontal dimensions of pipe and between structures, pipe grade, inlet and outlet flow line elevation of pipe, rim elevation of structure, location of centerline of structures and ends of pipe, size of pipe and an elevation view of the pipe in the fill.

Drainage Plan Sheets- Provide a general overview and location of drainage features. Use the drainage plans to review the locations of drainage in the field. Culverts should be located as close to natural drainage channels as possible. Do a rough check to see if the station shown in the plans coincides with the lowest point of the natural ground (use mileposts and your odometer to measure stationing).

Drainage Detail Sheets- Consists of drawings and notes that provide details about non standard drainage items.

Temporary Erosion and Sediment Control Plan (TESC) - For the purpose of obtaining permits, WSDOT includes the TESC in the Contract Plans. These sheets may be accepted in writing by the Contractor as the ESC plans for the project or the Contractor can modify the plans and submit for approval.

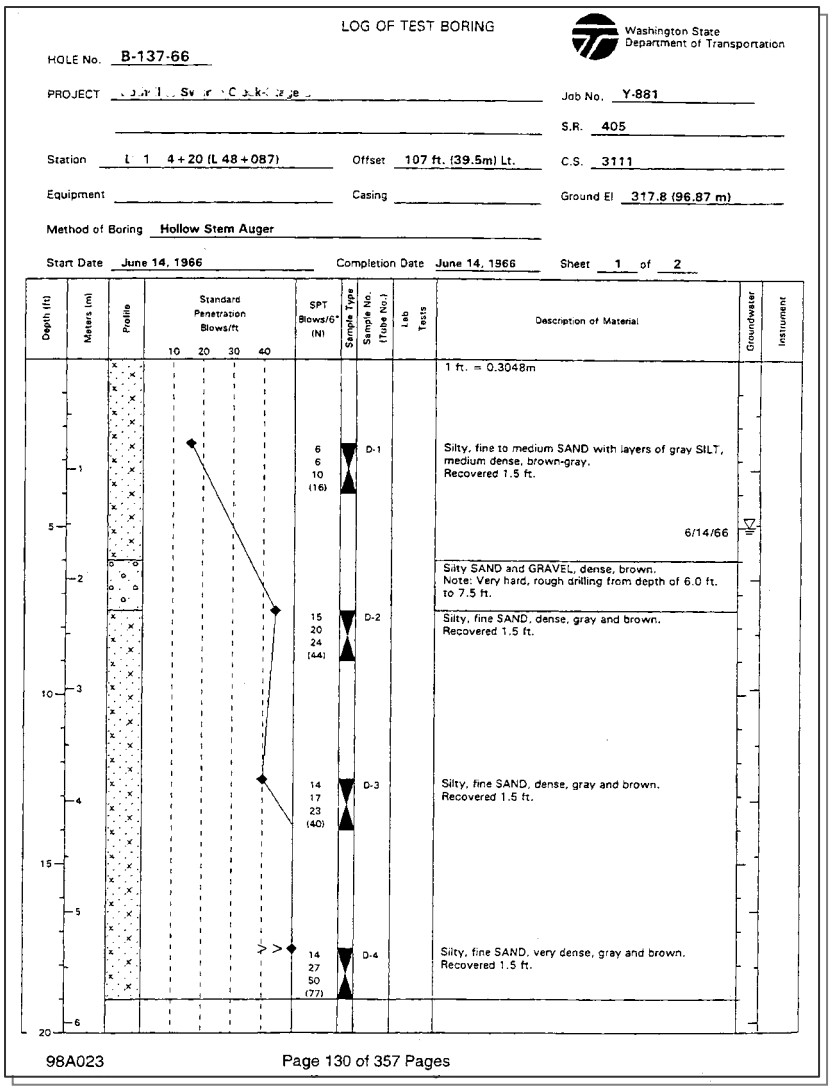
Other Documents

Boring Logs/ Geotechnical Reports

Boring logs are one piece of information used to develop the Geotechnical Report. The Geotechnical Report is used to address many constructability issues and could be beneficial to the inspector to review.

Boring logs are a very good source of information for the inspector. Before starting work, review the logs. Note anticipated changes in material, deposits of large rock, clay indicators, and the water level, as recorded, at the time of the boring.

Remember boring logs are informational only.



LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. B-137-66

PROJECT [illegible] Job No. Y-881

S.R. 405

Station L 1 4+20 (L 48+087) Offset 107 ft. (39.5m) Lt. C.S. 3111

Equipment _____ Casing _____ Ground El 317.8 (96.87 m)

Method of Boring Hollow Stem Auger

Start Date June 14, 1966 Completion Date June 14, 1966 Sheet 1 of 2

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
								1 ft. = 0.3048m		
	1			6 6 10 (16)	D-1			Silty, fine to medium SAND with layers of gray SILT, medium dense, brown-gray. Recovered 1.5 ft.		
5									6/14/66	
	2							Silty SAND and GRAVEL, dense, brown. Note: Very hard, rough drilling from depth of 6.0 ft. to 7.5 ft.		
				15 20 24 (44)	D-2			Silty, fine SAND, dense, gray and brown. Recovered 1.5 ft.		
10	3									
	4			14 17 23 (40)	D-3			Silty, fine SAND, dense, gray and brown. Recovered 1.5 ft.		
15										
	5			14 27 50 (77)	D-4			Silty, fine SAND, very dense, gray and brown. Recovered 1.5 ft.		
20	6									

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Hydraulic Permits

Review the permits for your project. Each project is unique so what happened on the last project you worked on may not be applicable to your current project.

Look for references to items like work windows, ordinary high water mark, buffer zones, etc.

Identify the agencies involved with the permits and make sure you have a contact list in case of emergency.

Be sure your permit is posted on the jobsite. At the jobsite means within the project limits. A good way to make sure the permit is available when needed, is for each inspector and the Contractor's superintendent and foreman to carry a copy in their vehicles.

Shoring Plan

WAC 296-155-657 requires a protective system for all trenches 4 feet or deeper.

Class Exercise #2: Read Section 2-09.3(3) D and Section 2-09.3(4) and answer the following questions.

1. Can the Contractor begin construction of the shoring before receiving an approval of the shoring submittal?

   Yes No

2. The shoring system must be designed for site _____ conditions.

3. Name two items that must be shown on the shoring submittal _____ and _____

Pre Construction

4. The structural shoring drawings and calculations shall be prepared by a licensed Professional Engineer and must carry the _____ and _____ of the Engineer.

5. When may a trench box **not** be used as shoring?

   a.

   b.

   c.

6. Can a Project Engineer approve the use of a trench box if it is supporting adjacent traffic? _____

Temporary Erosion and Sediment Control Plan

Make sure that all "Best Management Practices (BMPs)" are approved for use. The State has found that some BMPs do not meet our requirement so they have been removed from the list of approved BMPs. Also, this is an up-and-coming market and many new items are coming on the market yearly. These also must be approved before use on WSDOT projects.

Just because a BMP is approved does not make it appropriate for all uses. Check and see if the BMP is appropriate for the use indicated in the TESC plan. The Highway Runoff Manual will be a good resource for checking the plans.

Work should not begin until the BMPs are in place. At the pre construction meeting the Contractor is required to name the ESC Lead. Talk to the Contractor and ESC Lead about when they anticipate the material for the BMPs will arrive and maintaining a supply of materials to maintain the BMPs in case of an emergency situation.

Materials Documentation

A critical responsibility of every inspector is the documentation of materials being installed on the project. The Record of Material for your project will help identify some of the items you will need to document.

Record of Materials (ROM)

The ROM is created by the State Materials Laboratory for each project. It lists all major construction items and identifies the kind and quantities of materials that require quality control testing. This list is based on plan quantities and identifies the minimum number of acceptance tests needed for plan quantity, so it will need to be adjusted as quantities change. It also shows what documentation is required for acceptance of fabricated items.

The ROM is a living document that must reflect the current quantities and bid item for the Contract. Be sure to keep the Materials Documentation Engineer and Office Engineer informed of any changes made to drainage bid items.

Record of Material

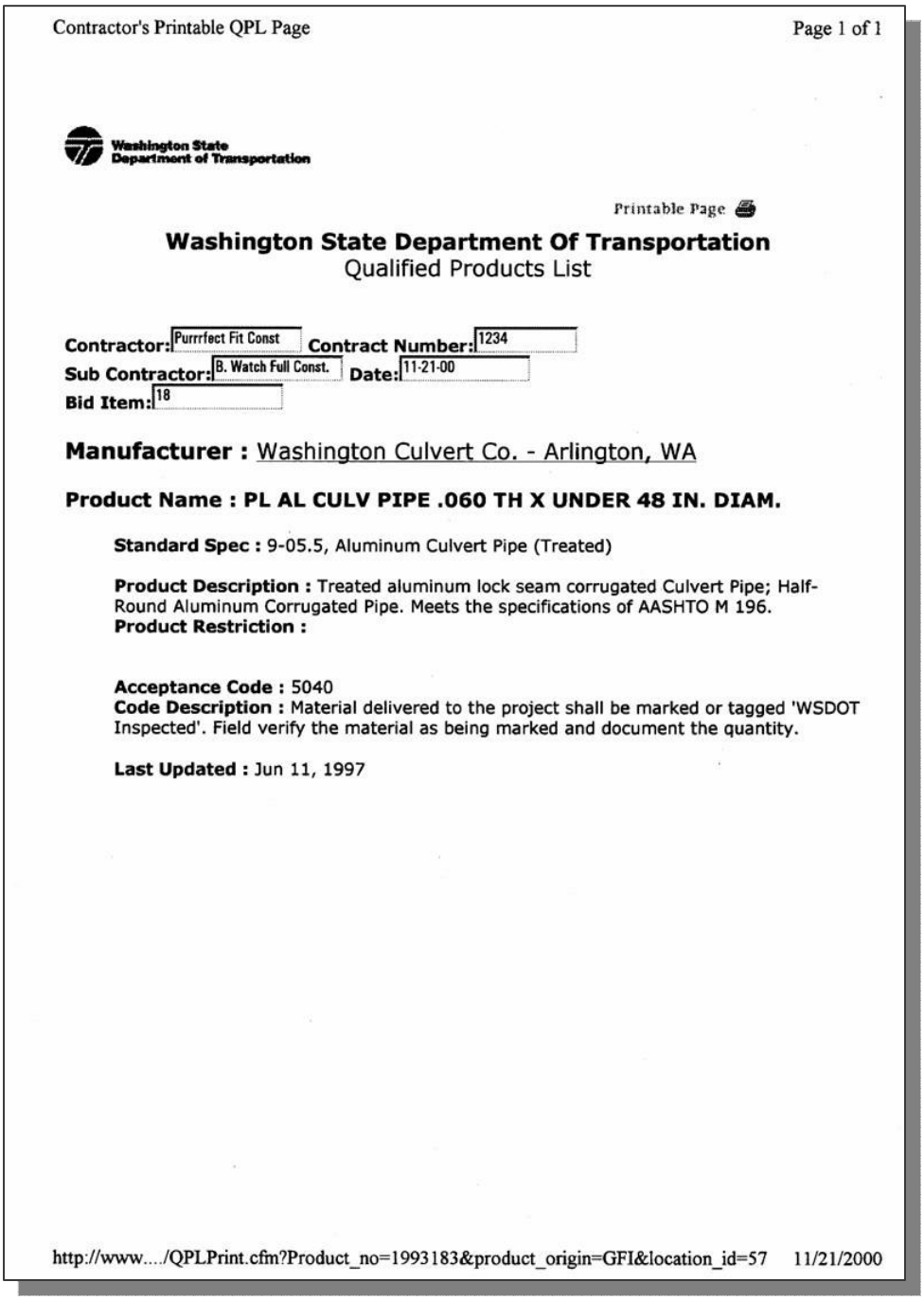
12/2/2004 08:33:50

Contract No. 006860

Bid Item	Quantity	Unit	Description	Documentation Req'd	Spec. Ref.
009.01	132840	C.Y.	EMBANKMENT COMPACTION	See Const. Manual for Comp. Testing	2-03.3(14)
010.01	1	EACH	DROP INLET TYPE 1	'WSDOT Inspected' Tag/Stamp	9-12.6
010.02	1	EACH	FRAME & GRATE	'APPROVED FOR SHIPMENT' Tag/Stamp	9-05.16
011.01	93	L.F.	SCHEDULE A CULV. PIPE 18 IN. DIAM.	Concrete Pipe Acceptance Report or Mfg. Cert. per option used or See Current QPL	9-05
012.01	150	L.F.	CL. V REINF. CONC. CULV. PIPE 18 IN. DIAM.	Concrete Pipe Acceptance Report	9-05.3(2)
013.01	128	L.F.	CL. IV REINF. CONC. CULV. PIPE 36 IN. DIAM.	'APPROVED FOR SHIPMENT' Stamp/Tag	9-05.3(2)
014.01	103640	TON	CRUSHED SURFACING BASE COURSE	52 Acceptance Sample(s) Required	9-03.9(3)

Qualified Products List (QPL)

Products listed in the QPL have been found capable of meeting the requirements of the Standard Specification or General Special Provisions. Check the acceptance code for any specific requirements for acceptance of the material. QPL is available online at www.WSDOT.wa.gov/biz/mats/QPL/QPL_search.cfm



Contractor's Printable QPL Page Page 1 of 1

Washington State Department of Transportation

Printable Page

Washington State Department Of Transportation
Qualified Products List

Contractor: Purrrfect Fit Const **Contract Number:** 1234
Sub Contractor: B. Watch Full Const. **Date:** 11-21-00
Bid Item: 18

Manufacturer : Washington Culvert Co. - Arlington, WA

Product Name : PL AL CULV PIPE .060 TH X UNDER 48 IN. DIAM.

Standard Spec : 9-05.5, Aluminum Culvert Pipe (Treated)

Product Description : Treated aluminum lock seam corrugated Culvert Pipe; Half-Round Aluminum Corrugated Pipe. Meets the specifications of AASHTO M 196.
Product Restriction :

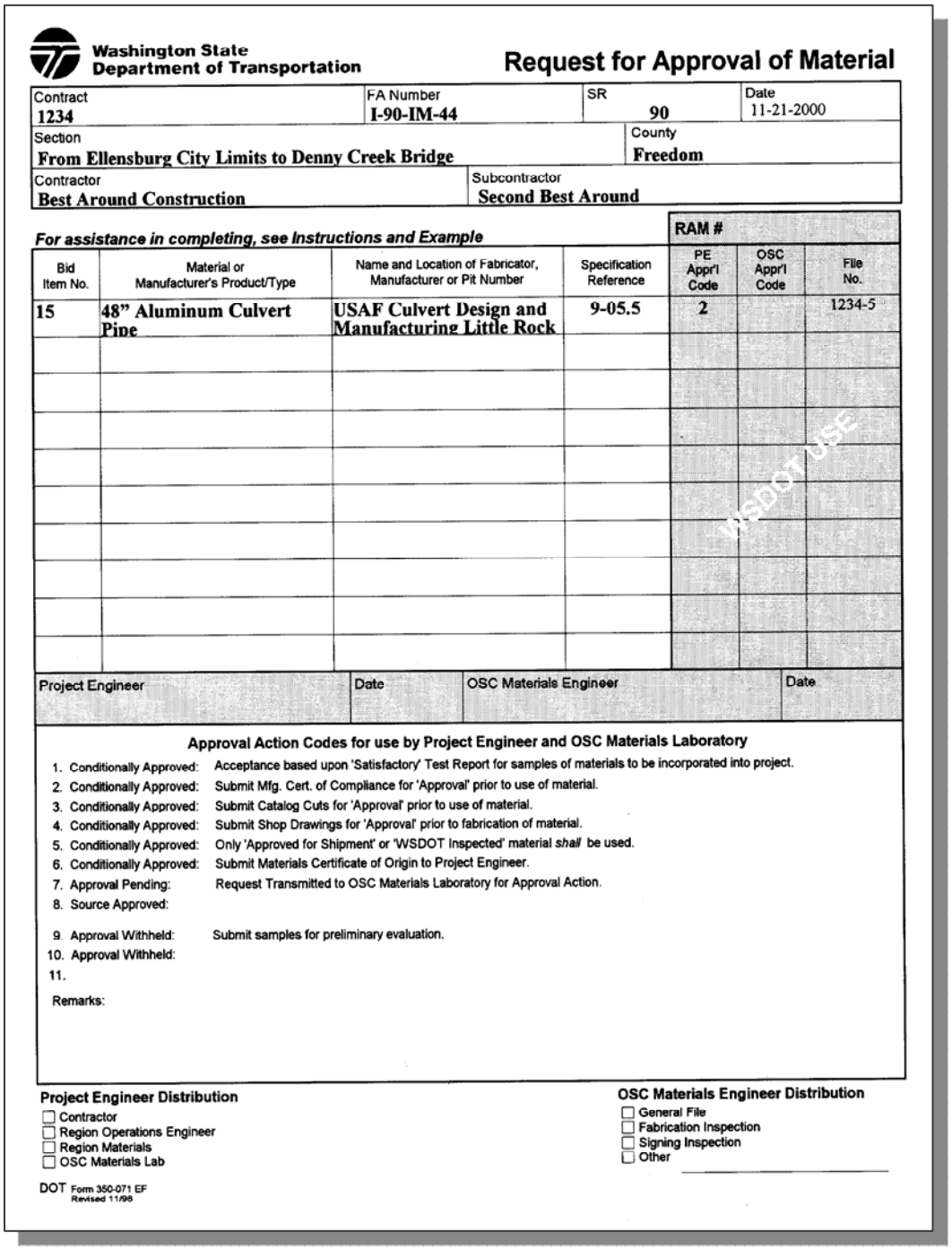
Acceptance Code : 5040
Code Description : Material delivered to the project shall be marked or tagged 'WSDOT Inspected'. Field verify the material as being marked and document the quantity.

Last Updated : Jun 11, 1997

http://www..../QPLPrint.cfm?Product_no=1993183&product_origin=GFI&location_id=57 11/21/2000

Request for Approval of Material (RAM)

Contractor fills out a RAM when the material is not listed in the QPL. A RAM is only approval to use the material on the project, not acceptance of the material.



Washington State Department of Transportation

Request for Approval of Material

Contract	FA Number	SR	Date
1234	I-90-IM-44	90	11-21-2000

Section	County
From Ellensburg City Limits to Denny Creek Bridge	Freedom

Contractor	Subcontractor
Best Around Construction	Second Best Around

For assistance in completing, see Instructions and Example

RAM #

Bid Item No.	Material or Manufacturer's Product/Type	Name and Location of Fabricator, Manufacturer or Pit Number	Specification Reference	PE Appr'l Code	OSC Appr'l Code	File No.
15	48" Aluminum Culvert Pipe	USAF Culvert Design and Manufacturing Little Rock	9-05.5	2		1234-5

WSDOT USE

Project Engineer	Date	OSC Materials Engineer	Date

Approval Action Codes for use by Project Engineer and OSC Materials Laboratory

1. Conditionally Approved: Acceptance based upon 'Satisfactory' Test Report for samples of materials to be incorporated into project.
2. Conditionally Approved: Submit Mfg. Cert. of Compliance for 'Approval' prior to use of material.
3. Conditionally Approved: Submit Catalog Cuts for 'Approval' prior to use of material.
4. Conditionally Approved: Submit Shop Drawings for 'Approval' prior to fabrication of material.
5. Conditionally Approved: Only 'Approved for Shipment' or 'WSDOT Inspected' material *shall* be used.
6. Conditionally Approved: Submit Materials Certificate of Origin to Project Engineer.
7. Approval Pending: Request Transmitted to OSC Materials Laboratory for Approval Action.
8. Source Approved:
9. Approval Withheld: Submit samples for preliminary evaluation.
10. Approval Withheld:
11.

Remarks:

Project Engineer Distribution

- ☐ Contractor
- ☐ Region Operations Engineer
- ☐ Region Materials
- ☐ OSC Materials Lab

OSC Materials Engineer Distribution

- ☐ General File
- ☐ Fabrication Inspection
- ☐ Signing Inspection
- ☐ Other _____

DOT Form 350-071 EF
Revised 11/96

Manufacturer's Certificate of Compliance (MCC)

Check the Record of Material for your project, the QPL, and RAM submittals to see if material coming to the project will need an MCC. Material should not be placed prior to receiving the MCC. Remember this is an alternative to sampling the material on the job. If the material is stamped by a WSDOT Fabrication Inspector, the MCC will not come to the jobsite. It will be collected by the Fabrication inspector and kept in their files.

Ten Cate Nicolon

Mirafi® 180N Certification

CSI Geosynthetics
3400 SE Columbia Way #43
Vancouver, WA 98661

Order: 129432

Fax#: 360-699-1344

This is to certify that Mirafi® 180N is a nonwoven geotextile composed of polypropylene fibers, which are formed into a stable network such that the fibers retain their relative position. 180N is inert to biological degradation and resists naturally encountered chemicals, alkalis, and acids.

Mechanical Properties	Test Method	Unit	Minimum Average Roll Value	
			MD	CD
Grab Tensile Strength	ASTM D 4632	kN (lbs)	0.9 (205)	0.9 (205)
Grab Tensile Elongation	ASTM D 4632	%	50	50
Trapezoid Tear Strength	ASTM D 4533	kN (lbs)	0.36 (80)	0.36 (80)
Mullen Burst Strength	ASTM D 3786	kPa (psi)	2618 (380)	
Puncture Strength	ASTM D 4833	kN (lbs)	0.58 (130)	
Apparent Opening Size (AOS)	ASTM D 4751	mm (U.S. Sieve)	0.180 (80)	
Permittivity	ASTM D 4491	sec^{-1}	1.2	
Permeability	ASTM D 4491	cm/sec	0.21	
Flow Rate	ASTM D 4491	$l/min/m^2$ ($gal/min/ft^2$)	3866 (95)	
UV Resistance (at 500 hours)*	ASTM D 4355	% strength retained	70	

* Certification based on independent lab testing. This is not covered by our current A2LA accreditation.

Sworn and subscribed before me this 27th day of May, 2004

Linda Evans
My commission expires December 8, 2005

Melissa Medlin
Quality Manager

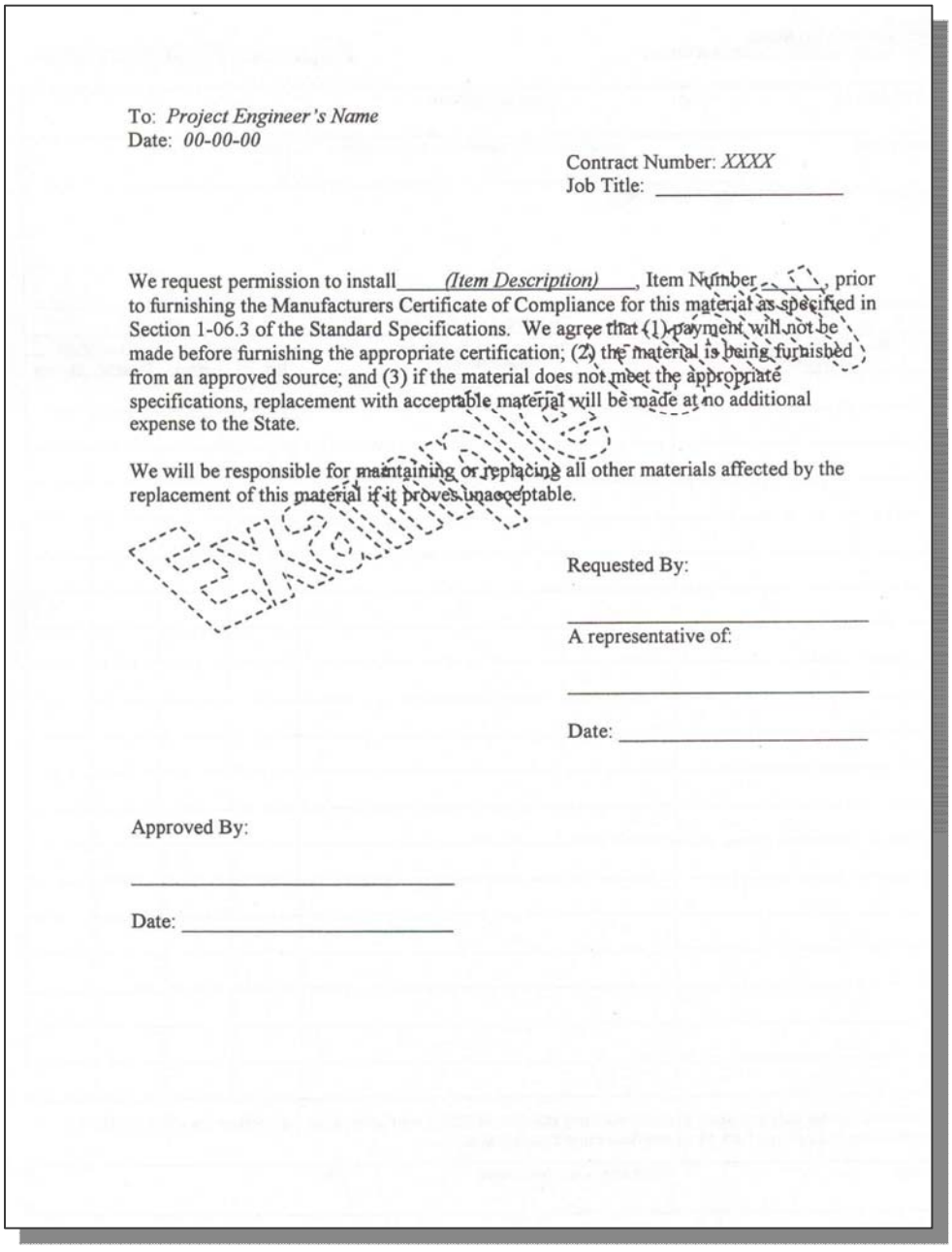
American Association of Laboratory Accreditation Certificate Number: 1291.01

JPSS000351
ETQR2

Ten Cate Nicolon USA
365 South Holland Drive / Pendergrass, Georgia 30567 / 706 693 2226 / 1 888 795 0808 / Fax 706 693 4400

Temporary MCC

What happens if the item does not require a Fabrication Inspector's stamp but requires an MCC, and the MCC does not arrive with the material? Can the material be placed without the Manufacturer's Certificate of Compliance? Read Standard Specification Section 1-06.3. Will the Contractor be paid for the material installed without the MCC?



To: *Project Engineer's Name*
Date: *00-00-00*

Contract Number: *XXXX*
Job Title: _____

We request permission to install *(Item Description)*, Item Number _____, prior to furnishing the Manufacturers Certificate of Compliance for this material as specified in Section 1-06.3 of the Standard Specifications. We agree that (1) payment will not be made before furnishing the appropriate certification; (2) the material is being furnished from an approved source; and (3) if the material does not meet the appropriate specifications, replacement with acceptable material will be made at no additional expense to the State.

We will be responsible for maintaining or replacing all other materials affected by the replacement of this material if it proves unacceptable.

Requested By:

_____
A representative of:

_____

Date: _____

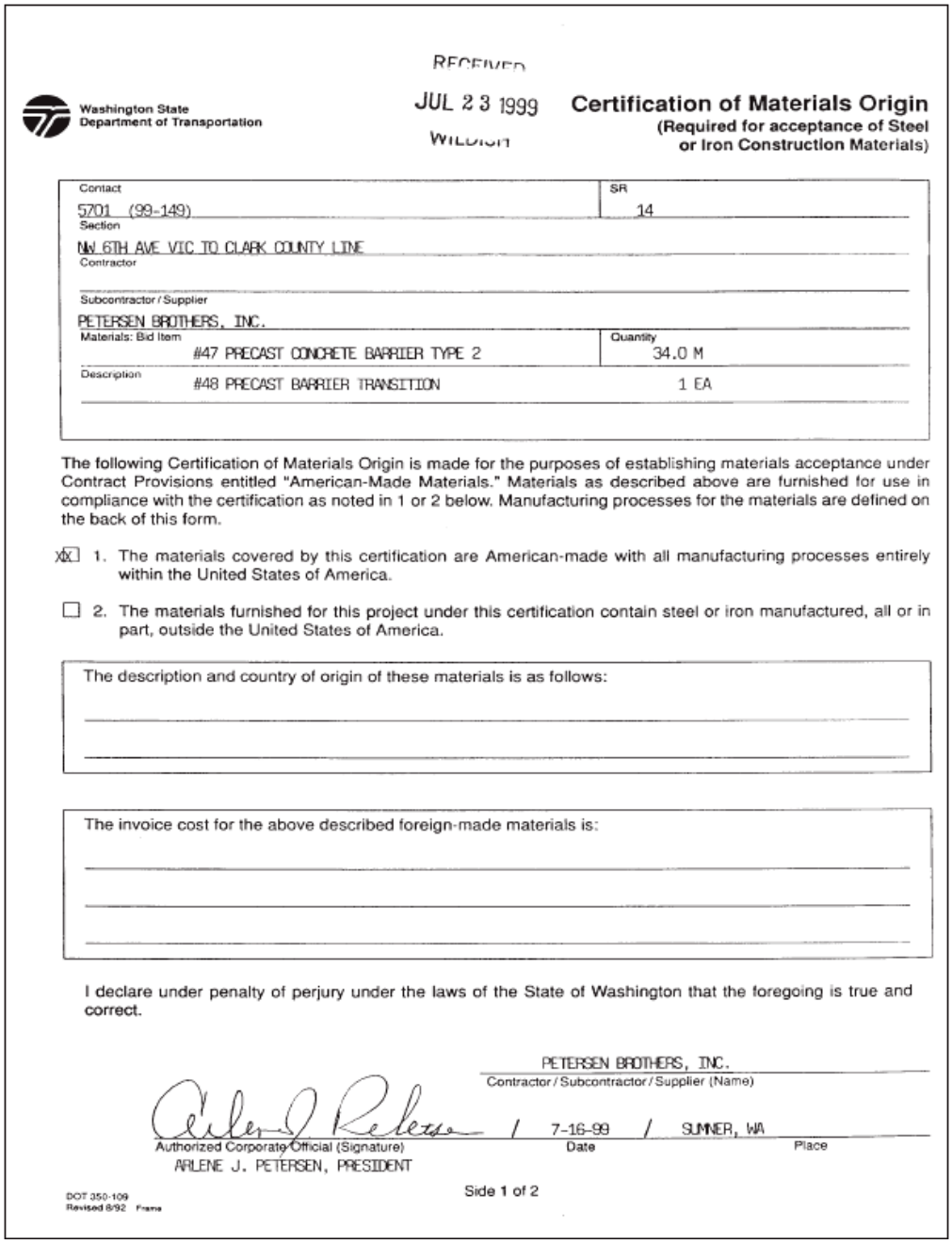
Approved By:

_____

Date: _____

Certification of Materials Origin

If the pipe is steel, iron or contains reinforcing steel and it is installed on a project with a "Foreign Made Material," the manufacturer must provide a "Certification of Materials Origin" to document the amount of American made steel or iron in the product.



RECEIVED
JUL 23 1999
WILDISH

Washington State Department of Transportation

Certification of Materials Origin
(Required for acceptance of Steel or Iron Construction Materials)

Contact	SR
5701 (99-149)	14

Section: NW 6TH AVE VIC TO CLARK COUNTY LINE

Contractor:

Subcontractor / Supplier: PETERSEN BROTHERS, INC.

Materials: Bid Item	Quantity
#47 PRECAST CONCRETE BARRIER TYPE 2	34.0 M
Description: #48 PRECAST BARRIER TRANSITION	1 EA

The following Certification of Materials Origin is made for the purposes of establishing materials acceptance under Contract Provisions entitled "American-Made Materials." Materials as described above are furnished for use in compliance with the certification as noted in 1 or 2 below. Manufacturing processes for the materials are defined on the back of this form.

XX 1. The materials covered by this certification are American-made with all manufacturing processes entirely within the United States of America.

☐ 2. The materials furnished for this project under this certification contain steel or iron manufactured, all or in part, outside the United States of America.

The description and country of origin of these materials is as follows:

The invoice cost for the above described foreign-made materials is:

I declare under penalty of perjury under the laws of the State of Washington that the foregoing is true and correct.

PETERSEN BROTHERS, INC.
Contractor / Subcontractor / Supplier (Name)

Arlene J. Petersen / 7-16-99 / SUMNER, WA
Authorized Corporate Official (Signature) / Date / Place

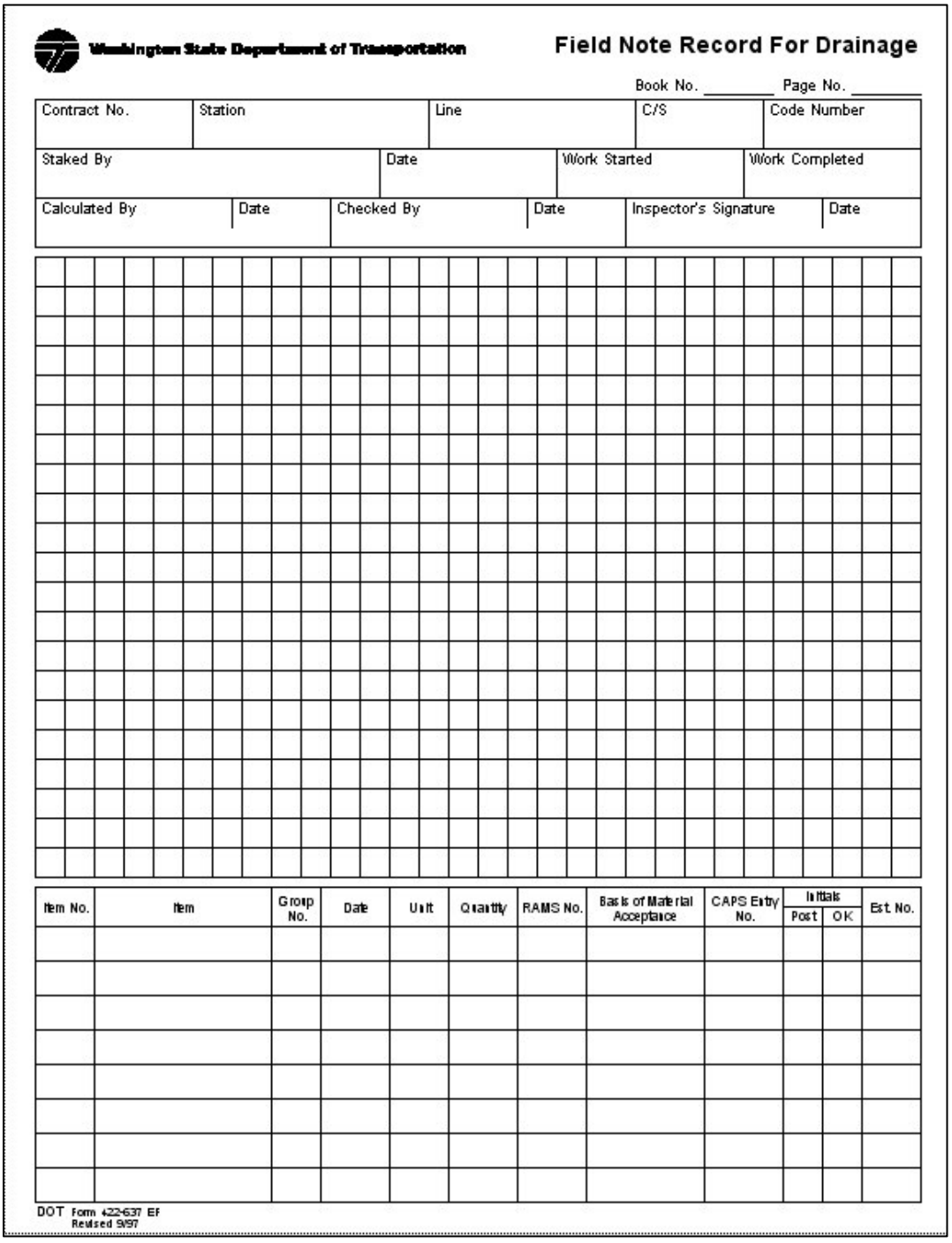
ARLENE J. PETERSEN, PRESIDENT

Side 1 of 2

DOT 350-109
Revised 8/92 Frame

Field Note Record for Drainage

A field note record must be filled out by the drainage inspector for each drainage structure installed or removed.



Washington State Department of Transportation

Field Note Record For Drainage

Book No. _____ Page No. _____

Contract No.	Station	Line	C/S	Code Number

Staked By	Date	Work Started	Work Completed

Calculated By	Date	Checked By	Date	Inspector's Signature	Date

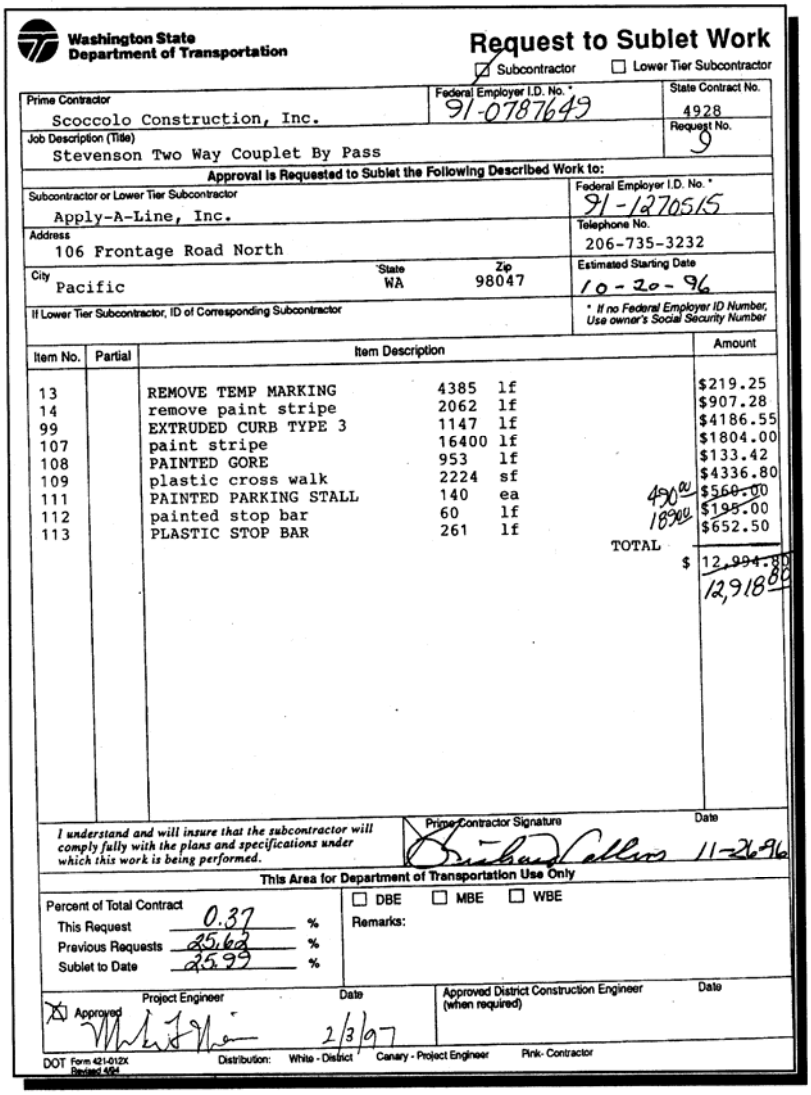
Item No.	Item	Group No.	Date	Unit	Quantity	RAMS No.	Basis of Material Acceptance	CAPS Entry No.	Initials Post	Initials OK	Est. No.

DOT Form 422-637 EF
Revised 9/97

Request to Sublet Work

On large Contracts contractors generally sublet the drainage work to companies that specialize in drainage installation. If the drainage work has been sublet make sure the Contractor has submitted a "Request to Sublet Work" before the subcontractor begins work.

Since WSDOT's contract is with the Prime Contractor only, it is a good idea to ask the Prime Contractor's representative if the Drainage Subcontractor can make monetary decisions such as, Force Account or Change Order work. This will prevent future misunderstandings when negotiating changes.



Washington State Department of Transportation

Request to Sublet Work

☑ Subcontractor ☐ Lower Tier Subcontractor

Prime Contractor: Scoccolo Construction, Inc.	Federal Employer I.D. No. *: 91-0787649
	State Contract No.: 4928
Job Description (Title): Stevenson Two Way Couplet By Pass	Request No.: 9

Approval is Requested to Sublet the Following Described Work to:

Subcontractor or Lower Tier Subcontractor: Apply-A-Line, Inc.	Federal Employer I.D. No. *: 91-1270515
Address: 106 Frontage Road North	Telephone No.: 206-735-3232
City: Pacific — State: WA — Zip: 98047	Estimated Starting Date: 10-20-96
If Lower Tier Subcontractor, ID of Corresponding Subcontractor	* If no Federal Employer ID Number, Use owner's Social Security Number

Item No.	Partial	Item Description			Amount
13		REMOVE TEMP MARKING	4385	lf	$219.25
14		remove paint stripe	2062	lf	$907.28
99		EXTRUDED CURB TYPE 3	1147	lf	$4186.55
107		paint stripe	16400	lf	$1804.00
108		PAINTED GORE	953	lf	$133.42
109		plastic cross walk	2224	sf	$4336.80
111		PAINTED PARKING STALL	140	ea	490@ $560.00
112		painted stop bar	60	lf	1890 $195.00
113		PLASTIC STOP BAR	261	lf	$652.50
				TOTAL	$ 12,994.80 12,918.80

I understand and will insure that the subcontractor will comply fully with the plans and specifications under which this work is being performed.

Prime Contractor Signature: Richard Collins — Date: 11-26-96

This Area for Department of Transportation Use Only

Percent of Total Contract

This Request	0.37 %
Previous Requests	25.62 %
Sublet to Date	25.99 %

☐ DBE ☐ MBE ☐ WBE

Remarks:

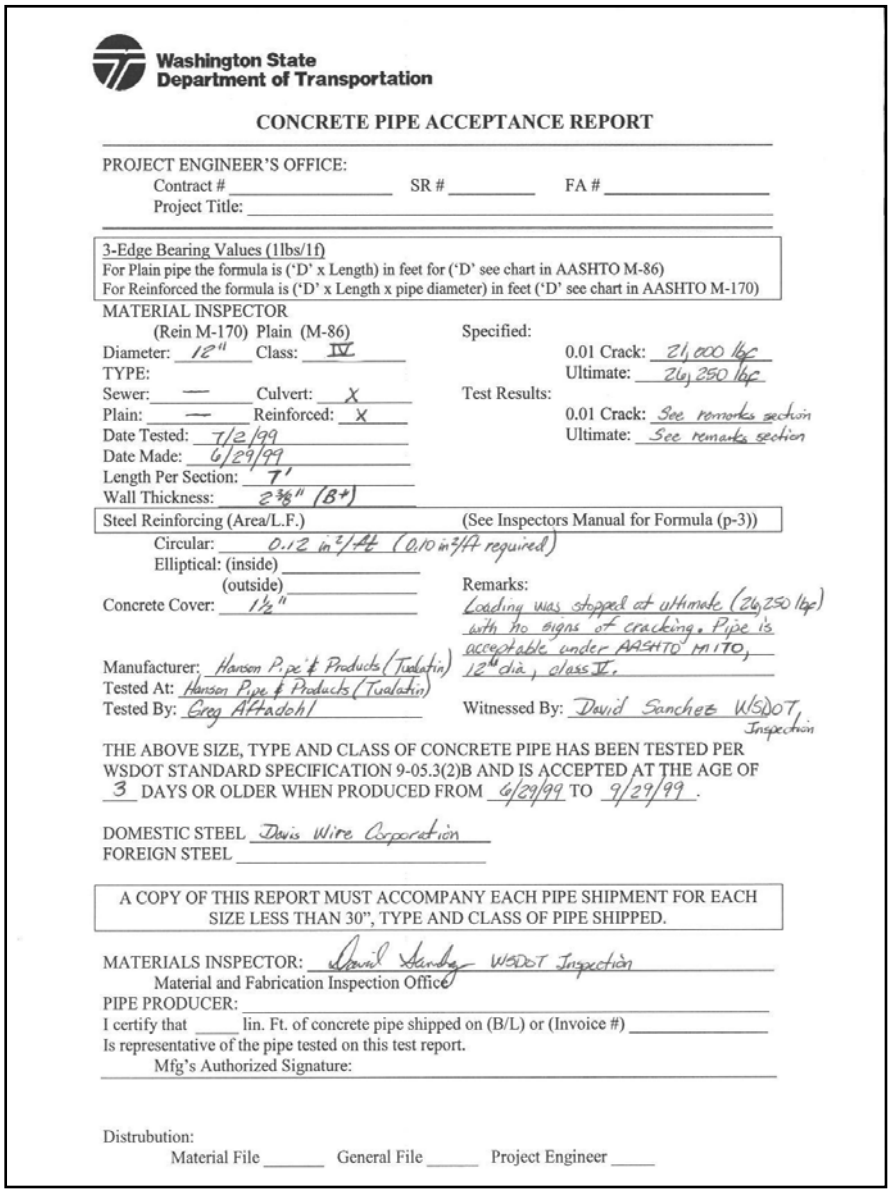
☒ Approved — Project Engineer: [signature] — Date: 2/3/97

Approved District Construction Engineer (when required) — Date

DOT Form 421-012X Revised 4/94 — Distribution: White - District; Canary - Project Engineer; Pink - Contractor

Concrete Pipe Acceptance Report

At the request of the Pipe Manufacturer or the Project Office, the Fabrication Inspector will perform tests on concrete pipe less than 30" in diameter at approved sources. Pipe produced within 90 days of the inspector's test can be shipped and accepted based on the Concrete Pipe Acceptance Report. The Concrete Pipe Acceptance Report documents the Fabrication Inspector's test results and is signed by the manufacturer to certify that the pipe produced is representative of the pipe tested on the report.



Washington State Department of Transportation

CONCRETE PIPE ACCEPTANCE REPORT

PROJECT ENGINEER'S OFFICE:
Contract # _____ SR # _____ FA # _____
Project Title: _____

3-Edge Bearing Values (1lbs/1f)
For Plain pipe the formula is ('D' x Length) in feet for ('D' see chart in AASHTO M-86)
For Reinforced the formula is ('D' x Length x pipe diameter) in feet ('D' see chart in AASHTO M-170)

MATERIAL INSPECTOR
(Rein M-170) Plain (M-86)
Diameter: 12" Class: IV
TYPE:
Sewer: — Culvert: X
Plain: — Reinforced: X
Date Tested: 7/2/99
Date Made: 6/29/99
Length Per Section: 7'
Wall Thickness: 2 3/8" (B+)

Specified:
0.01 Crack: 21,000 lbf
Ultimate: 26,250 lbf

Test Results:
0.01 Crack: See remarks section
Ultimate: See remarks section

Steel Reinforcing (Area/L.F.) (See Inspectors Manual for Formula (p-3))
Circular: 0.12 in²/Ft (0.10 in²/Ft required)
Elliptical: (inside) _____
(outside) _____
Concrete Cover: 1½"

Remarks:
Loading was stopped at ultimate (26,250 lbf) with no signs of cracking. Pipe is acceptable under AASHTO M170, 12" dia, class IV.

Manufacturer: Hanson Pipe & Products (Tualatin)
Tested At: Hanson Pipe & Products (Tualatin)
Tested By: Greg Affadohl
Witnessed By: David Sanchez WSDOT Inspection

THE ABOVE SIZE, TYPE AND CLASS OF CONCRETE PIPE HAS BEEN TESTED PER WSDOT STANDARD SPECIFICATION 9-05.3(2)B AND IS ACCEPTED AT THE AGE OF 3 DAYS OR OLDER WHEN PRODUCED FROM 6/29/99 TO 9/29/99.

DOMESTIC STEEL Davis Wire Corporation
FOREIGN STEEL _____

A COPY OF THIS REPORT MUST ACCOMPANY EACH PIPE SHIPMENT FOR EACH SIZE LESS THAN 30", TYPE AND CLASS OF PIPE SHIPPED.

MATERIALS INSPECTOR: David Standley WSDOT Inspection
Material and Fabrication Inspection Office
PIPE PRODUCER: _____
I certify that _____ lin. Ft. of concrete pipe shipped on (B/L) or (Invoice #) _____
Is representative of the pipe tested on this test report.
Mfg's Authorized Signature: _____

Distrubution:
Material File _____ General File _____ Project Engineer _____

Density Curves

Obtain preliminary samples of all material that will be used for pipe bedding and backfill. This should be done as soon as the material becomes available. It takes approximately three days to run the tests to produce a density curve, but remember you probably aren't the only project requesting a curve so try to arrange for testing two weeks ahead of when you will need the curve. As materials become mixed during the project you might want to have another curve run to see if the material meets the original virgin soil.

Schedule density tests ahead of time. Pipe work goes fast so make sure the Qualified Nuclear Gauge operator is available and onsite at the start of the trench work. Discuss with the gauge operator which materials are being used and the location of the work so he/she can come equipped with the right density curves.

Surveying

Communicate with:

a. Contractor

b. Survey Crew

c. Other State Inspectors

Field review of layout

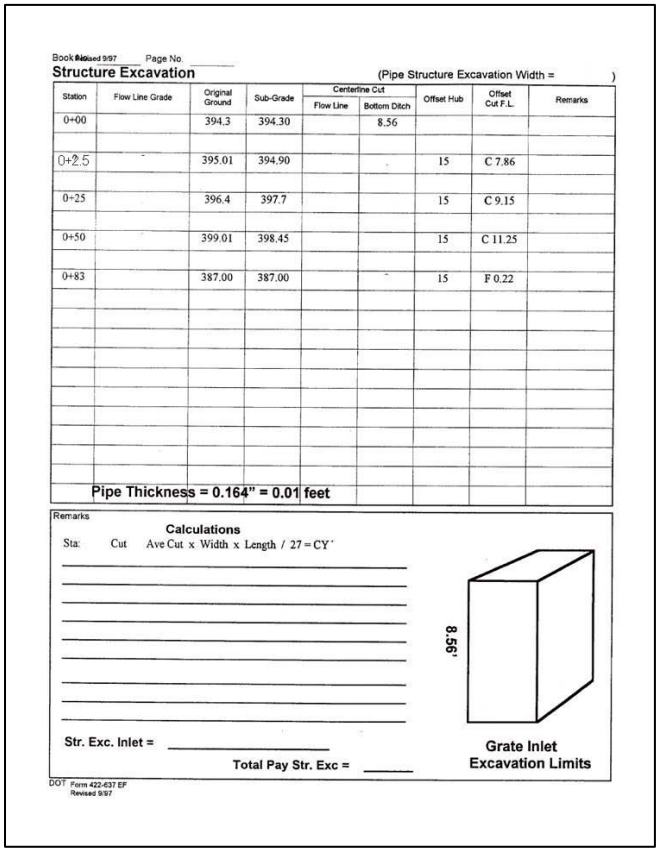
a. Properly staked?

b. Location reasonable?

Field Note Record for Drainage

a. Fill out before work starts

b. Have the survey crew record survey information on the Field Note Record for Drainage.



Book Revised 9/97 Page No.

Structure Excavation (Pipe Structure Excavation Width =)

Station	Flow Line Grade	Original Ground	Sub-Grade	Centerline Cut		Offset Hub	Offset Cut F.L.	Remarks
				Flow Line	Bottom Ditch			
0+00		394.3	394.30		8.56			
0+2.5		395.01	394.90			15	C 7.86	
0+25		396.4	397.7			15	C 9.15	
0+50		399.01	398.45			15	C 11.25	
0+83		387.00	387.00			15	F 0.22	

Pipe Thickness = 0.164" = 0.01 feet

Remarks

Calculations

Sta: Cut Ave Cut x Width x Length / 27 = CY

8.56'

Str. Exc. Inlet = _____

Total Pay Str. Exc = _____

Grate Inlet Excavation Limits

DOT Form 422-637 EF Revised 9/97

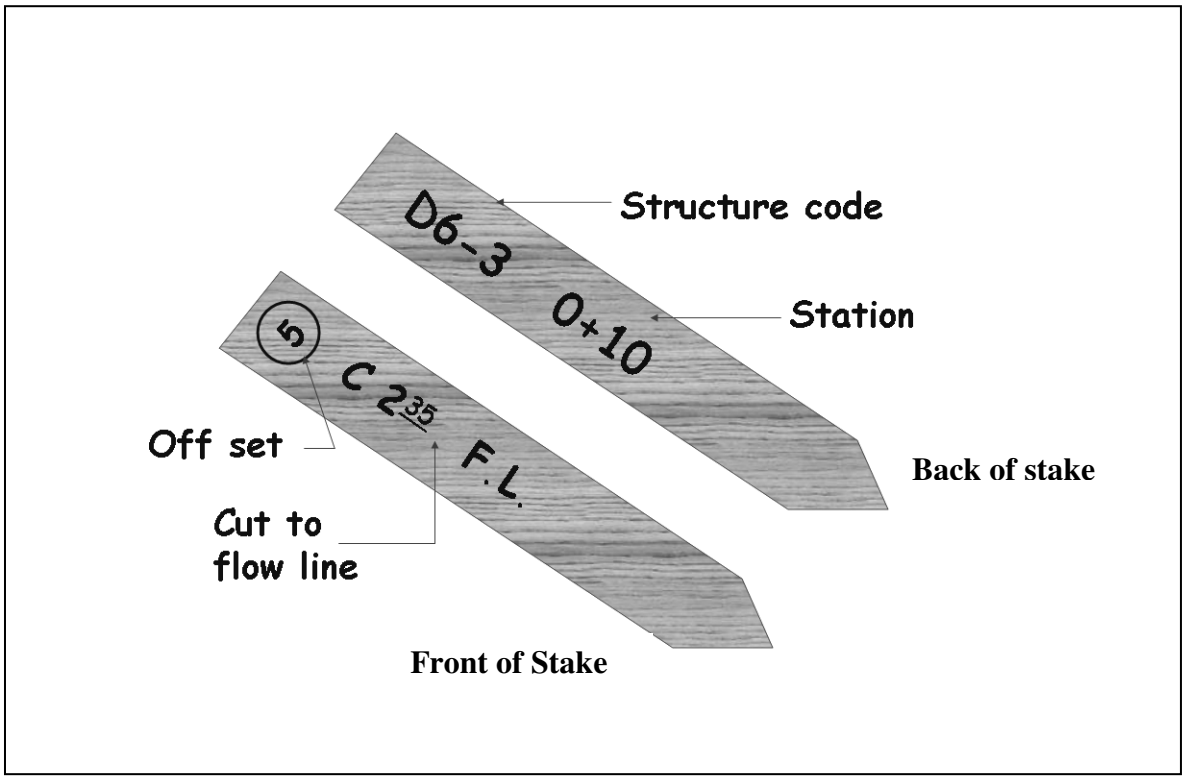
Drainage Stakes

Generally the survey crew will set a hub at both ends of the pipe and then set offset stakes to those hubs. Setting offset stakes allows the Contractor to dig the trench without disturbing the survey stakes.

Discuss the location of the offset stakes with the Contractor to avoid putting the stakes in an area the Contractor needs for his operation. Offset distances are shown in a circle at the top of the stake.

Before staking begins review Chapter 15 of the *Highway Survey Manual* for the proper method of staking drainage structures. Drawing below is a good example of a standard drainage stake. Also, see Standard Plan H-14.

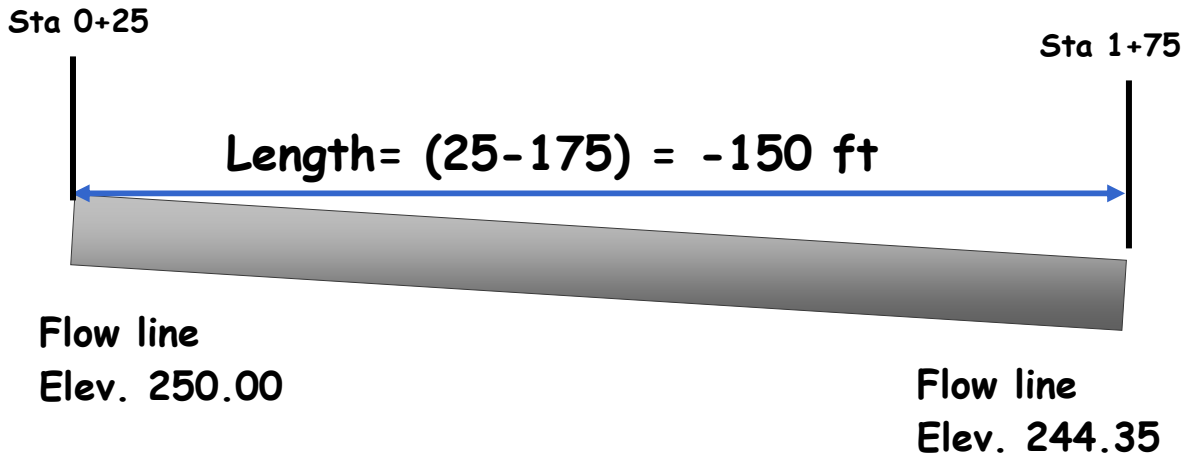
The front side of the stake will contain information about offsets, cuts or fills to flow line. The back side of the stake will identify the structure code and station of the drainage structure.



Standard Drainage Stake

Calculating Pipe Grade

To calculate a pipe grade you need to know two things: the horizontal distance of the pipe and the change in the flow line elevation from one end to the other.



Subtract the elevation at Sta 0+25 from the elevation at Sta 1+75

Example: 250.00 – 244.35 = 5.65 feet

In this example, there is 5.65 feet of vertical difference between the inlet and outlet of the pipe. Subtract the station corresponding to the lower elevation from the station corresponding to the higher elevation. (Remember stations are in 100' increments).

Example: 25 – 175 = -150 feet

Note: Carry the minus sign (-150 ft) into your next calculation. The sign indicates the direction of flow for the pipe.

Divide the difference in elevation by the horizontal distance. This will give a ft/ft measurement which will be useful in calculating the flow line of the pipe. To get the % grade multiply the ft/ft measure by 100.

Example: $\frac{5.65}{-150'}$ = -0.037667 ft/ft = -.0377 %

Because the result is a negative grade we know the inlet of the pipe is at Sta 0+25 and the outlet is at Sta 1+75.

Determining Flow Line Elevation

To check the flow line at a specific point on the pipe, use the following equation:

Given:

C = flow line elevation at a specific point on the pipe

A = Inlet or outlet flow line elevation

D= distance from the new point to the inlet or outlet in feet

S= slope of pipe (ft/ft))

C = A+ (D x S)

Using the information from the previous exercise we will calculate the flow line elevation of a point 25 ft from the inlet of the pipe. The grade in the previous example was -.0377%.

Calculate the distance from the inlet/outlet to the new point. In this example the distance is 25 ft. Multiply the distance from the inlet/outlet to the new point (25 ft) times the slope of the pipe.

Example: 25 feet x - 0.0377 = -0.943

Now you have the difference in elevation between "A" and "C". **Watch your signs!** If you are using a distance from the outlet the slope will be positive, but from the inlet the slope will be negative. In this case, the slope is negative.

Add the difference in elevation to the "A". In this example, that would be the flow line elevation at Sta. 0+25.

Example: 250.00 + (– 0.943) = 249.057 round to 249.06

The flow line elevation 25 feet away from the Sta 0+25 is **249.06**.

Class Exercise 3

For this exercise, you will be using the "Supplemental Detail Sheets" used earlier in class. In the appendix, remove the "Field Note Record for Drainage" showing Structure Code D15-1. On the front **ONLY**, complete the areas that have question marks (?) and calculate the flow line elevations at pipe stations, 0 +2.54, 0+25, 0+50, and 0+83.

Part 5

Construction

Part 5 Construction

Order of Work

Check your Contract plans for the order of work. According to Standard Specification _____ cleaning the existing drainage is the first order of work.

Check the Special Provisions for information on the construction of detention ponds. Generally, environmental agencies require that permanent detention ponds be built before grading begins to provide a settlement area for sediment.

Limiting Exposure

Limiting the amount of erodible soils exposed and the duration of exposure will reduce the amount of temporary erosion and sediment control needed on the project. Before clearing and grubbing begins look in Standard Specification 8-01 for the amount of soil the Contractor is allowed to expose. Also check permits to see if there are permit conditions covering the amount or time soil can be exposed.

If conditions on the project warrant, the "Engineer" can increase or decrease the amount of area that can be exposed as long as permit conditions are not compromised.

Installation of Best Management Practices (BMPs)

The Contractor is required to name an Erosion and Sediment Control (ESC) Lead at the time of the preconstruction meeting (Standard Specification 8-01.3(1) B). The ESC lead is responsible for implementing the Temporary Erosion and Sediment Control plan, which includes the installation and maintenance of the BMPs. As soon as possible talk to the ESC Lead about:

- having materials onsite at the start of work to build and maintain BMPs
- contact information for weekends and holidays
- maintenance of BMPs
- removal of BMPs when they are no longer needed

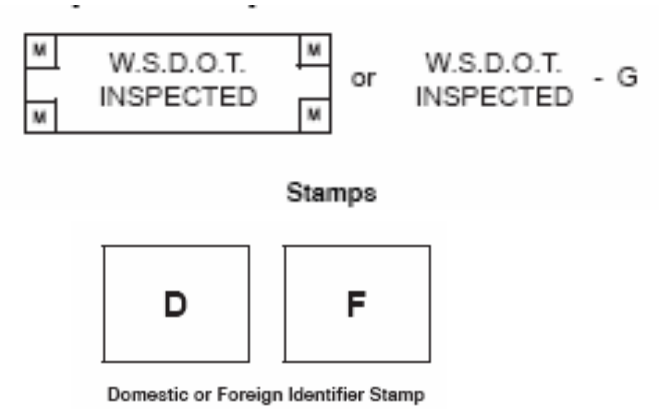
During construction take pictures with date stamps to document the condition of the drainage BMPs on a regular basis.

Does your office have someone assigned as a TESC inspector? Who do they want you to contact if there is a problem?

Delivery and Acceptance of Pipe

Check the paperwork before installing pipes. The first thing to check for any material, is if there is a RAM or QPL submitted for the product. Does the manufacturer and product match what the Contractor submitted? Review Chapter 9 of the Construction Manual for acceptance requirements. Some of the items to watch for when the pipe is delivered are:

Metal Pipe- Is the pipe treated? If the pipe is treated it must be stamped or tagged by a Fabrication Inspector.



Fabrication Inspection Stamps

Not every pipe will be stamped but, a representative amount of pipe in the shipment must be marked or the Fabrication Inspection Office must be called for an on-site inspection.

If the pipe is steel or iron and it is installed on a project with a "Foreign Made Material" clause any pipe bearing an "F" stamp must be identified and the Project Office must obtain a "Certificate of Material Origin" to document the amount of foreign steel.

The best way to document the stamp is to draw a replica of the stamp on the Field Note Record or in your IDR (reference IDR on Field Note Record).

Untreated metal pipe is accepted by QPL. The pipe manufacturer must be identified on the pipe or Bill of Lading. The pipe must have the appropriate AASHTO specifications for the steel sheet, gauge thickness and heat number stamped on the pipe. If the pipe is not stamped it should not be installed.

PE and PVC pipe- Did a Manufacturer's Certificate of Compliance accompany the pipe? Check the certificate to see if it identifies the production lots for the material delivered. During installation, check the pipe for dents, punctures or misshaping, reject any pipe that has been damaged in storage or handling.

Concrete pipe over 30" – Requires an "Approved for Shipment Stamp" on each section of pipe. Check the pipe for cracks or chips at the time of delivery. Watch how the pipe is handled and stored (i.e. bell and spigot pipe should be blocked under the barrel to relieve stress on the bell).

Approved for shipment stamp

Concrete pipe less than 30"- Is accepted by the receipt of a *Concrete Pipe Acceptance Report* and visual inspection of the pipe at time of placement. The *Concrete Pipe Acceptance Report* must accompany the pipe when it is shipped (Item 1, Pg 5-5 of this workbook). It is the inspector's responsibility to verify that the report matches the material delivered to the jobsite. The inspector should check:

Type of pipe - Does the type of pipe delivered match what is shown on the report? (Item 2, Pg 5-5 of this workbook)

Note: A higher class of pipe may be substituted for a lower c*lass of pipe*. (i.e Class V can be substituted for Class IV) Some Contract Plans call for Class IV pipe, if the Pipe Manufacturer is only making Class V at the time he may substitute the Class V instead of changing his operation.

Date of pipe- Is the date etched on the pipe within the date range shown on the report? (Item 3, Pg 5-5 of this workbook). Does it meet the curing requirements?

Linear footage- Does the linear footage certified match what was delivered? The amount delivered can be smaller than what is certified on the *Concrete Pipe Acceptance Report* but cannot exceed the certified amount. (Item 4, Pg 5-5 of this workbook)

Signatures- Has the report been signed by the Fabrication Inspector, the pipe producer and the manufacturer's authorized representative?

Once you have verified the "Concrete Pipe Acceptance Report" document your verification in your IDR or on the "Concrete Pipe Acceptance Report" (Item 5, of Pg. 5-5 of this workbook).

Check the pipe during delivery, stamps or tags only mean the pipe was approved at the time of inspection. If the pipe is damaged due to shipping, handling, storage or installation, it must not be installed.

Washington State Department of Transportation

CONCRETE PIPE ACCEPTANCE REPORT

PROJECT ENGINEER'S OFFICE:
Contract # _____ SR # _____ FA # _____
Project Title: _____

3-Edge Bearing Values (1lbs/1f)
For Plain pipe the formula is ('D' x Length) in feet for ('D' see chart in AASHTO M-86)
For Reinforced the formula is ('D' x Length x pipe diameter) in feet ('D' see chart in AASHTO M-170)

MATERIAL INSPECTOR
(Rein M-170) Plain (M-86)
Diameter: 12" Class: IV
TYPE:
Sewer: — Culvert: X
Plain: — Reinforced: X
Date Tested: 7/2/99
Date Made: 6/29/99
Length Per Section: 7'
Wall Thickness: 2 3/8" (B+)

Specified:
0.01 Crack: 21,000 lbf
Ultimate: 26,250 lbf
Test Results:
0.01 Crack: See remarks section
Ultimate: See remarks section

Steel Reinforcing (Area/L.F.) (See Inspectors Manual for Formula (p-3))
Circular: 0.12 in²/Ft (0.10 in²/Ft required)
Elliptical: (inside) _____
(outside) _____
Concrete Cover: 1½"

Remarks:
Loading was stopped at ultimate (26,250 lbf) with no signs of cracking. Pipe is acceptable under AASHTO M170, 12" dia, class IV.

Manufacturer: Hanson Pipe & Products (Tualatin)
Tested At: Hanson Pipe & Products (Tualatin)
Tested By: Greg Affadohl
Witnessed By: David Sanches WSDOT, Inspection

2 →

THE ABOVE SIZE, TYPE AND CLASS OF CONCRETE PIPE HAS BEEN TESTED PER WSDOT STANDARD SPECIFICATION 9-05.3(2)B AND IS ACCEPTED AT THE AGE OF 3 DAYS OR OLDER WHEN PRODUCED FROM 6/29/99 TO 9/29/99.

3 →

DOMESTIC STEEL Davis Wire Corporation
FOREIGN STEEL _____

1 → A COPY OF THIS REPORT MUST ACCOMPANY EACH PIPE SHIPMENT FOR EACH SIZE LESS THAN 30", TYPE AND CLASS OF PIPE SHIPPED.

MATERIALS INSPECTOR: David Sanchez WSDOT Inspection
Material and Fabrication Inspection Office

4 →
PIPE PRODUCER: _____
I certify that _____ lin. Ft. of concrete pipe shipped on (B/L) or (Invoice #) _____
Is representative of the pipe tested on this test report.
Mfg's Authorized Signature: _____

5 → Verified size and class of pipe. Date of fabrication was in range of date listed above and cured for a minimum of three days before shipping Dan Cotton 8/10/99

Distrubution:
Material File _____ General File _____ Project Engineer _____

Daily Documentation

The three main documents you will be involved with daily are:

Inspector's Daily Report- This is a **daily** account of what is occurring on the project. Your IDR should be clear, concise, correct, complete and concurrent.

Force Account Sheets- These are required to be completed and signed daily by the Contractor when force account work is in progress. Do not use force account sheets if the work has not been agreed to by the Contractor and Project Engineer. If you fill out Force Account Sheets for protested work the Contractor must be paid force account.

Report of Protested work- This report needs to be filled out when the Contractor is performing the work under protest and the payment for the work is either contested or has not been identified as force account.

As drainage items are inspected and accepted in the field, it is very important that you document the work. The following exercise will help you identify items that should be recorded in your IDR.

Class Exercise 4:

As a team, find the following information in the IDR on Page 5-8.

1. What structure codes were worked on August 25, 2003?

2. Who authorized the adjustment of the pipe run for structure KB2-4, why was it adjusted?

3. What material was received on August 25, 2003 and was there any problems with the shipment?

4. What pipes were tested? Did they pass?

Inspector's Daily Report

Washington State Department of Transportation

Inspector's Daily Report

IDR Sheet 2 of 2 Sheets	Final Record Book	Page
Contract	Day	Date
9999	Monday	August 25, 2003

DIARY - Including but not limited to: a report of the day's operations, time log (if applicable), orders given and received, discussions with contractor, and any applicable statements for the monthly estimate.

At 8:10 AM Big Pipe started laying 12" ADS pipe for KB3-2 at station 633+50 Lt & Rt. The last 18 ft. section did not line up with knockout on inlet. Crew backfilled pipe and warped pipe to inlet opening. Alignment of pipe was off by about 1 ft.

The drainage crew went onto force account at 11:00 AM to pot hole for utilities, codes KB2-4, Sta 621+40 Lt & Rt and KB2-3 Sta 620+40 Lt & Rt. KB2-4 conflicts with existing water 10" waterline. Also found gas line. Dan Cotton adjusted pipe run. Pipe was lowered to go under waterline. Inlet elevation was not changed. The outlet of KB 2-3 was also lowered to match KB2-4. The crew went off force account at 1:00 PM

The Contractor received a shipment of 32 pieces of 12" Class V concrete pipe and 3 Type 2 Grate Inlets, Tops, Base and Grates. I checked the shipment for stamps and documentation and found two of the grates were not stamped approved. I informed the contractor of the missing stamps and said those two grate could not be placed until I received approval from the fabrication inspector. The shipping invoice matched the pipe quantity and the quantity listed on the Concrete Pipe Acceptance Report. The pipe manufacturer dates were within the range stated on the acceptance report and all section of pipe were cured the minimum 6 days required by the acceptance report.

I did one density test on KB3-2 and it passed with a 96.3 percent of maximum density.

Grate with approval Stamp #B001479 was placed on drainage code KB3-2

Drainage Crew air tested codes: KB8-4, KB5-8, KB5-7 and all passed

Drainage code KB3-2 is complete except for air test.

DOT Form 422-004A EF
Revised 1/94

10/25/03 Signed *Sam Spendmore* Inspector

Safety

As an inspector, part of your responsibility is to make the Contractor aware of any safety hazards you may see on the jobsite. Some common safety issues are listed below:

Personal Safety

Wear proper personal safety equipment such as:

Flagging vest

Hard hat

Steel toed boots (if required)

Eye protection

Watch out for construction equipment

Don't assume the operator can see you. Heavy equipment has many blind spots. You want the operator to know you are near the equipment. Make eye contact with the operator and indicate the direction you will be heading before walking beside or behind any equipment.

Be sure trenches are shored or the slopes are laid back correctly before entering

Do not enter a trench if it is improperly shored or if the slopes are incorrectly laid back (Standard Specification _____). Inform the Contractor and your Supervisor of the unsafe condition and document the situation in your Inspector's Daily Report (IDR).

Washington State Department of Labor and Industry

Fatality Narrative

Construction Laborer Killed When Trench Collapses

A 29 year old laborer was working in a 7 foot 6 inch deep trench that was not shielded, sloped or shored. The victim entered the unprotected trench by climbing down a ladder. When the walls began to fail the victim, started to climb the ladder but was hit in the back by dirt and knocked to the bottom of the trench where he was partially engulfed by soil. The company owner and an employee attempted to dig out the victim without success. A fire department emergency response team arrived at the scene and attempted to rescue and resuscitate the unresponsive victim. He was pronounced dead at the scene. The victim died of blunt force injury to the head.

Entering unsafe working areas is hazardous

Don't enter confined spaces without an entry permit

Confined spaces can contain lethal gases. Generally, trenches are not considered confined spaces but be sure gas or diesel powered equipment is properly vented outside the trench to prevent carbon monoxide poisoning.

A confined space is defined as an area that is:

- large enough and so configured that an employee can bodily enter and perform assigned work; **and**
- limited or restricted means for entry or exit (For example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry.); **and**
- **not** designed for continuous employee occupancy

If the Contractor is working in an area meeting all these criteria make sure you obtain an entry permit before entering the structure

Check pipes for uninvited visitors

Pipes provide great habitats for many animals so be sure to check before reaching into pipes.

Beware of uninvited occupants

Public Safety

Open Trenches

Be sure all open trenches are covered each night. Standard Specification _____ requires the Contractor to cover the traveled way and auxiliary lane with steel-plates. **The steel plates must be anchored so they do not slip.** Also, remember to have the Contractor build a wedge between the plates and the roadway to smoothly transition the cars. Post warning signs and have the Contractor check the plates daily when they are in use more than 24 hrs.

Traffic Control

An important safety item you may not think about as a drainage inspector is traffic control. Much of the work you will be inspecting is located on or near the shoulder of the road therefore, it is very important that traffic control is in place before beginning work. Check the traffic control plans to make be sure it provides adequate protection for all the workers. Also, watch out for traffic when entering and leaving the work area. Don't surprise motorists by abruptly entering or leaving the work area, give plenty of notice of your intentions.

Open Drainage Structures

Make sure all manholes and catch basins are covered with a metal lid when not in use.

Tripping hazards

Picking eyes are to be removed when they are no longer needed. Cords, picking eyes and forms can become tripping hazards which may result in painful injuries.

Culvert Pipe

Excavation

Before work begins on a culvert all staking must be complete. Check to make sure the offset stakes are out of the path of the Contractor's operation? Does the culvert look right according to the geography of the area (i.e. culvert in low spot)? Compare the information on the stakes to the plans, is everything correct? Does the information on the stakes make sense? Talk to the Contractor, does he have any questions about the staking information?

Trench excavation in advance of the pipe laying should be kept to a minimum. If the Contractor chooses to open more trench than can be completed by the end of the working day, he must cover the trench with steel plates as talked about in the Safety section of this manual and Standard Specification 1-07(23).1.

As the trench is being excavated, check the width to be sure it is not less than the amount specified in Division 2-09 of the Standard Specifications. Do spot checks to make sure the bottom of the trench is at the proper grade.

Foundation/Bedding

If the Contractor encounters ledgerock, boulders or stones, these need to be removed to provide a minimum of 6" of clearance under all portions of the pipe.

If the foundation material is unsuitable, the unsuitable material must be removed to the limits determined by the Engineer and the material taken to a disposal site. The trench must be backfilled to the bottom of the pipe zone with gravel backfill for pipe zone bedding, gravel backfill for foundations or other suitable material and compacted to form a solid foundation. Obtain a copy of the permit for the disposal site from the contractor. Inspect with the following concerns in mind:

- Is the native material satisfactory for bedding the pipe?
- Clean earth or sand?
- Free of clay, frozen lumps, roots and excess moisture?
- Maximum size of rock 3"?

If the Engineer determines the native material can be used, the material must be loosened, regraded and compacted.

If pipe bedding is required, the trench must be excavated 6" below the bottom outside of the pipe. If the pipe is a bell and spigot pipe, the 6" will be measured from the bottom lip of the bell.

Pipe bedding must be placed prior to installation of pipe, in lifts of 6" or less and each lift must be compacted to 90 percent of maximum density. You will need to obtain a sample of the bedding material before the Contractor begins trench excavation. Send the sample to the Regional Materials Laboratory for a gradation analysis and a maximum density curve. This will save time later if the bedding material is required.

If groundwater is encountered during the excavation of the trench, the Contractor shall furnish, install and operate the equipment needed to keep excavations above the foundation level free from water. The groundwater must be examined for turbidity and handled in accordance with Standard Specification 8-01.3.

Material excavated from trenches and piled adjacent to the trench shall be maintained so that the toe of the slope remains 2 feet from edge of trench.

Excavation is paid neat line per Section 2-09.4 of the *Standard Specifications.*

Note whether contractor has the proper equipment to do the work.

Shoring or extra excavation is required for excavation 4 feet or more in depth, and does not meet the open pit requirements of Standard Specification 2-09.3(3)B.

Grade and Flow Line

Before the pipe is installed, the inspector must check the bottom of the trench to be sure it is properly graded.

Do not allow the Contractor to use wedges or blocks to change the grade or line of the pipe. Wood wedges and blocks deteriorate over time causing loss of support to the pipe. Use bedding material to adjust the line and grade of a pipe.

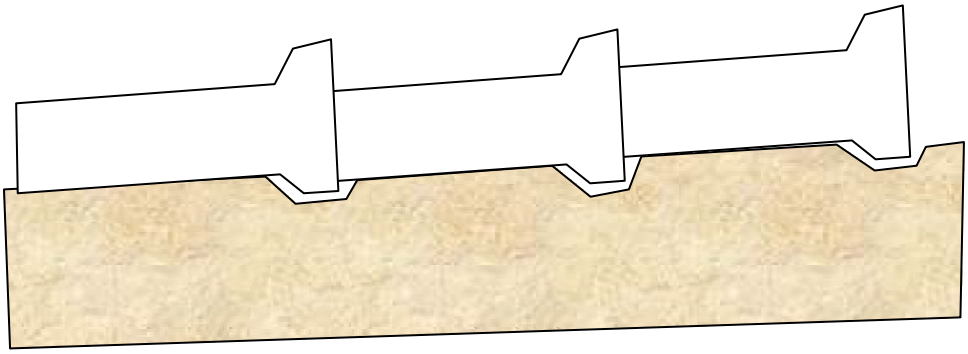
Changing the Pipe Grade

In cases where the foundation is too hard or too soft, it may be possible to adjust the pipe grade to avoid having to remove extra material. Before making any field adjustments you should consult the designer and the Regional Hydraulics Engineer to be sure the adjustment will not adversely affect the function of the pipe.

Installing Pipe

All pipe is to be laid upgrade unless otherwise specified by the Engineer. Laying pipe uphill keeps pipe in longitudinal compression until the backfill can be placed.

The bell of the pipe is always laid upgrade and the pipe bedding must be removed to accommodate the bell so the barrel of the pipe is fully supported by the pipe bedding.



Support the pipe on the barrel <u>not</u> on the bell

Be sure all rubber gaskets are installed properly. Gaskets and coupling bands should arrive with the pipe along with a manufacturer's approved lubricant. Check to see that the Contractor is following the manufacturer's recommendations when installing gaskets and coupling bands. Once the gasket is in place the Contractor must keep it clean and free of debris while inserting the next section of pipe. The Contractor should not lubricate or install the gasket until just before inserting the next section of pipe; this will help keep it clean while the Contractor is maneuvering the pipe into place. Once the gasket is in place the Contractor will align the pipes and force the pipe home.

Be sure no damage is done to the pipe during this procedure. The Contractor should use blocks or wedges between the face of the pipe and the pry bar to prevent damage.

Gasket joints tend to creep apart so it is a good idea to keep realignment of the pipe to a minimum during the jointing process. Also, backfilling should begin immediately after the pipes are joined and the last pipe of the day should be blocked to prevent creeping.

Do not let the Contractor put humps or sags in the pipes. This will put pressure on the joints eventually causing them to fail. The pipe is required to be laid so that the pipe invert is within $\pm$ 0.03 at the time of backfill.

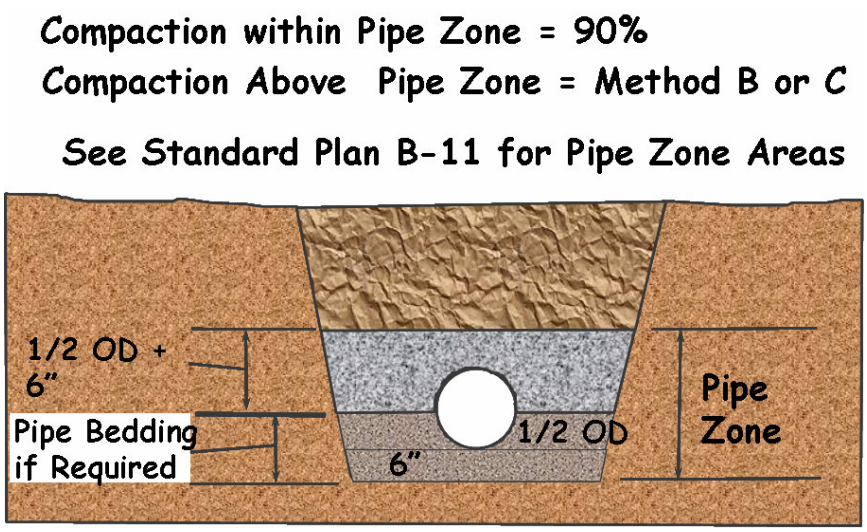
Backfilling

Backfilling is to begin as soon as possible after the pipe is laid. Pipe zone backfill material must be:

- Clean earth or sand
- Free of clay, frozen lumps, roots and excess moisture,
- With a maximum size of rock or lumps being 3”

When the backfill is being placed around the pipe make sure the lifts are brought up evenly on both sides of the pipe to prevent the pipe from shifting position.

Standard Plan B-11 shows the dimensions of the pipe zone areas. The diagram below is a diagram of the pipe zone requirements for a 12” metal pipe. Notice the pipe bedding, the pipe is buried to one half the outside diameter in the pipe bedding. This is done by placing the pipe bedding to its full depth (6” + ½ O.D.) and then removing material to accommodate the pipe. This method is used so the “haunch” area gets compacted.



For pipe placed in a new embankment, the backfill above the pipe zone shall be placed in accordance with Section 2-03.3(14) C of the Standard Specifications. The new embankment is generally built to two feet above the pipe, and then the trench is cut to flow line.

If the pipe is placed under an existing roadway the backfill over the pipe shall be placed in 6" lifts and compacted to 95 percent of maximum density. If the pipe is placed in non-traffic areas the backfill above the pipe zone shall be placed in 6" lifts and shall be compacted to 85 percent of maximum density.

Pipes must have a minimum of 2 ft cover prior to equipment hauling over them.

Watch for settlement during backfill. Be sure the backfill is stabilized before covering with surfacing and pavement.

Pipe ends

A dike of impervious material shall be placed around the inlet of the pipe to prevent water piping along the side of the pipe. The dike shall be 2 feet long and shall surround the pipe completely to form an impervious barrier.

Pipe ends shall be made of the same material as the pipe unless otherwise specified in the Contract Plans. Generally, culverts are only allowed to extend beyond the slope when the slope is inaccessible to vehicles. For slopes accessible to vehicles the culverts are beveled to match the slope of the embankment or ditch slope. If safety bars are required they shall be installed in accordance with the Standard Plans.

Riprap may be required at the outlet of the pipe to disperse the energy of the flow so it does not erode the slope below the pipe.

Measurement

Limits of structure excavation are defined in Section 2-09.4 of the *Standard - Specifications* and paid neat line.

The length of the culvert and end sections are in linear feet, measured along the invert of the pipe, as defined in Section 7-02.4 of the *Standard Specifications*.

1. Pipe is measured to the inside face of catch basins and grate inlets.
2. Beveled end sections are considered as part of pipe.
3. Flared end sections will be measured by the number of units.
4. Tapered end section with safety bars will be measured by the unit per each.
5. Hand placed riprap is measured by the cubic yard in place.

Calculating Structure Excavation for pipes

Using the information from the previous exercise calculate the horizontal pay limits for structure D15-1. (Section 2-09.4 of the *Standard Specifications)*

From worksheet:

Sta	Cut	Ave. Cut
0+2.54	**7.23**	
0+25	**8.92**	
0+50	**11.18**	

Length x horizontal limit x avg. cut = cy of excavation
27

Sta 0+2.54

Sta 0+ 25

Sta 0+50

Sta 0+83

Total Structure Excavation =

Manholes, Grate Inlets, and Catch Basins

Excavation and Grading

All are similar to culverts.

Some items that are different are:

- The excavation shall be sufficient to allow 1' between the structure and the side of the trench.
- Backfill around structure with gravel backfill for foundation or gravel backfill for pipe zone bedding.
- The bottom of the manholes, grate inlets, and catch basins need to be correct so the knockouts will be at the right elevation for the pipe to enter the structure.

Installation

When the Contractor is installing a manhole, grate inlet or catch basin make sure the structure is fully supported as it is lowered into position. After the structure is placed the pipe will be installed in the structure make sure:

- Ends of pipes are trimmed flush to the inside wall and grouted to prevent water leaking around pipe
- Backfilling does **not** begin around manholes, grate inlets, and catch basins until the grout has thoroughly set.
- Check the position of inlets and grates to be sure they are located in the path of the water.

Inlet is improperly located to catch water

Covers and Grates

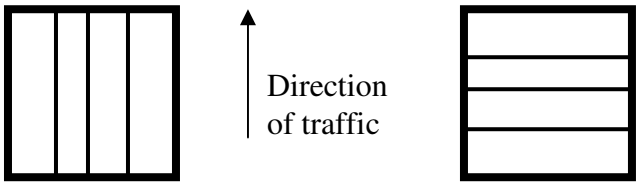
Grates and covers are not set to final elevation until paving, earthwork or gutters are completed. The grates are set just a little lower than final grade to allow water to enter the structure. Do **not** allow the Contractor to set the grates higher than the final elevation. If the grate is too high the water will not enter the structure but will pond on the roadway. Conversely, if the grate is set too low it causes a safety hazard to traffic and collects trash which clogs the grate and causes ponds on the roadway. Once the grate is set final grouting of the risers can be completed.

It is critical that the frame and grate stamp be aligned when installed. The Fabrication Inspector stamps the frame and grate so that the adjacent mated edges are stamped with one stamp. If the stamp is not aligned the leveling pads will not be in the correct position to prevent the grate from rocking. Be sure to document that the stamp was aligned in your IDR or Field Note Record.

Be sure the grates and inlets are installed with the longest dimension perpendicular to the flow of water. This allows more water to be captured as it flows over the grate.

Inlet is set at correct elevation and location

Watch the veins of the grate to make sure they are not hazardous to bicycle traffic.



Unsafe for bicycles **Safe for bicycles**

Backfilling

Section 2-09 of the *Standard Specifications* defines compaction for these items.

Watch for damage or settlement.

Measurement

These structure items are measured per each.

Manholes in excess of 10 feet in height will be measured per foot for each additional 1.0 feet of height over 10 feet.

Structure excavation is by the cubic yard and measured 1 foot outside the perimeter of the structure.

Shoring or extra excavation is by the square foot measured at centerline of the trench. It is measured from original ground to the bottom limits of the structure excavation for the length of the work.

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Underdrain pipes

Underdrain pipes are used to intercept groundwater and seepage and carry it away from the roadway prism. There are four critical issues when installing underdrain pipes:

- perforations are face down
- Gravel Backfill for Drain is placed around the pipe
- the trench is at least 3” deeper than the grade of the pipe
- if geotextile fabric is required, make sure the Contractor stores and installs it properly. (fabrics are sensitive to UV rays)

Sampling Geotextile Material

Excerpt taken from a newsletter by Don Brouillard Physical Testing Supervisor for the State Materials Laboratory in Tumwater

Here are some tips, Tricks, and Traps for Geotextile Sampling and Submitting:

Tip 1 Sampling: The sample should not be taken from the outer wrap of the roll nor the inner wrap of the core. Outside and inside layers of the roll may have been damaged or wrinkled. Waste a bit on the end. If the contractor complains, remind him that if you sample the end and it fails - that entire roll is rejected!

We prefer the sample to be 6 feet by the full width of the roll but the minimum is 1.5 yd by the full width of the roll and must also contain a minimum area of 6 sy. The reason we need so much is because we are going to cut that sample into 78 specimens and the specimens have to be staggered so that the same threads are not tested in more than one specimen.

Tip 2 Submitting: The samples need to be handled properly as improperly handled samples could cause an acceptable roll to be rejected. Keep the material clean; dirt, mud, etc. can clog the openings.

Woven samples must be rolled around a tube as folding will cause some weaves to open and some to close. Roll it so that the 6' is the length of the roll not the 15' or 20'.

TRICK: Buy a four inch PVC pipe cut to about 7 feet. Write your mail stop on the tube and we will return it for your future samples!

Non-woven samples (looks like the felt) may be folded but no smaller than a 2' x 2' square. It can also be rolled around a tube in the same manner as the woven fabric.

Wrap or box the samples to protect from shipping damage and UV exposure.

Tip 3 Required Information: The required information for geotextiles is located in both the Construction Manual and the Materials Manual under WSDOT Test Method No. 914. In Section 6.b. it states that the following information must be submitted with the sample:

1. Manufacturer's Name and Address. (usually on the cert which is required for #5)

2. Full Product Name. (Geotex 801, 180N, ProPex2004)
3. Geotextile Roll Number. Which roll was sampled?
4. Proposed usage. How is the material being used? If for Underground Drainage or Permanent Erosion Control, the Survivability and Drainage Class must be stated. Please note that if your Special Provisions / Contract Plans do not indicate this information then Standard Specification 2-12.2 states that it must meet the most stringent of the requirements.
5. Certified Test Results. This must include the UV Resistance at 500 hours and be signed by a corporate official. This cert should meet the requirements Std. Spec. 1-06.3

Although not specifically called for, the Lot Number is very beneficial because if the roll fails and Geotextiles on occasion DO FAIL, you will need to submit two additional samples from two different and untested rolls from that same lot. If either of those fails, the entire lot is rejected!

TRAP: Testing will not begin until all information is received - so don't bother submitting a sample until you have it all!

Sample Transmittal

Washington State Department of Transportation

Sample Transmittal

PO Box 47365
Olympia, WA 98504-7365

Lab ID No. **0000123456**

Contract Number	SR Number*	Section*	FOSSC Lab Number
006412			
County/City Control Number*	County/City*		Region Lab Number

Material Type	Make and Model	Specification Reference	Bid Item Number
Geotextile for Underground Drainage	Geotex 801	9-33.2	56.1

Producer/Manufacturer	Supplier
Amoco	NW Linings

Sample Number	Lot Number	Roll Number	Heat Number	Reel Number	Certificate Number
1	BOL 156554	987654			

Pit Number	Stockpile Number	Truck/Car Number	Used at Station	To Station	Quantity Represented
					3000 sy

Sampled At	Sampled By	Date Sampled	Tested At	Tested By	Date Tested
Job Site	J. Ramstad	4/9/2002			

Field: ☐ Accept ☐ Reject	Based on Test No.	Asphalt% In Design	Asphalt% Requested	Mix ID Number	Ignition Furnace Corr. Factor OSC: Field:

Screen												S.E.	Dust Ratio	% Asphalt	Max. Density
% Passing															
Fracture %															
Specs. **															

Remarks
Moderate Survivability, Class B

* Not Required for WSDOT contracts beginning with "00"
** Not Required for Standard Specifications Materials

DOT Form 350-056 EF
Revised 6/99

Project Engineer	Submitted By	Phone
D. Brouillard	B. Heryford	360-709-5446

350-056 Sample Transmittal

Backfill

Backfill is placed in 12" lifts and compacted with three passes of a vibratory roller for each layer. The Gravel Backfill for Drains is specially designed to allow water to flow freely so the Contractor must be careful not to contaminate the material. Contamination of the material can cause the holes in the pipe to clog rendering the system useless.

If fabric is required, place the fabric in the trench first, then place 3" of Gravel Backfill for Drains being careful not to damage the fabric. Place the remaining backfill as described above and wrap the fabric over the top of the Gravel Backfill for Drain being sure to overlap the fabric enough that it will not pull apart.

Poor installation-gap in fabric will allow fines to enter backfill material preventing water flow.

Measurement

Underdrain pipe is measured per linear foot of pipe placed.

Structure excavation Class B per cubic yard. (See Section 2-09.4 of *Standard Specifications*.)

Gravel backfill for drain per cubic yard neat line measurement.

Filter fabric defined in the contract provisions. It usually is by the square yard.

Shoring and cribbing is measured in the same manner as for culverts.

Calculating Structure Excavation for Structures

The structure excavation limit for a manhole, inlet or catch basin is calculated by adding one foot to each side of the perimeter of the structure.

Example:

Given:

Inlet dimensions= 37" x 54"

Cut to bottom of box = 8.56 ft

Change inlet dimension to feet = $\frac{37}{12}$ = **3.08 ft** and $\frac{54}{12}$ = **4.5 ft**

Limits of structure excavation:

3.08 ft + 1 ft + 1 ft**= 5.08 ft**

4.50 ft + 1 ft + 1 ft **= 6.50 ft**

Calculating cubic yards of material excavated:

$\frac{5.08' \times 6.50' \times 8.56'}{27}$ **= 10.47 cy**

Storm and Sanitary Sewer Pipe

Sanitary sewer pipe installation is mainly controlled by local environmental - agencies. Inspection of these pipes will follow the local agencies' requirements.

Excavation

Excavation procedures are the same as for culvert pipes.

Shoring or extra excavation is required if the trench depth is 4 feet or greater, and does not meet the open pit requirements of Standard Specification 2-09.3(3)B.

Foundation/Bedding

Check bottom of trench, if the existing foundation is rocky, hard pan, or cemented gravel, a cushion may be required. Use gravel backfill for pipe zone bedding in these areas.

If the foundation is too soft for sufficient stability, it may be replaced with gravel backfill for foundations.

Installation & Backfilling

The installation procedures for Storm and Sanitary Sewer pipe are the same as for culverts.

The maintaining of the grade line for storm sewers is critical since they are designed for an anticipated flow. If the grade requires changing the inspector should notify the designer so the capacity of the pipe can be checked to see if it is adversely affected by the change. If the change causes loss of capacity other changes may be required.

Testing Storm Sewers

Exfiltration Test — Storm Sewers — Standard Specification 7-04.3(1) B

1. Must use clear water.
2. Minimum of 6 feet of water column above crown of pipe.
3. One gallon per hour, per inch of diameter, per 100 LF of pipe with 6 feet water column.
4. Not to exceed 16 feet of water column from invert of lower end.
5. Do not enter drainage structure while pipe is filled with water.
6. Attach test results with number of feet of completed installation, **actually** tested, to the paynote.

Low Pressure Air Test — Storm Sewers

1. Low pressure air test on **storm** sewer pipe 30 inches in diameter or less. Over 30 inches in diameter tested one joint at a time.
2. Do not enter drainage structure while a plugged pipe is under pressure.
3. Attach test results with number of feet of completed installation **actually** tested to the paynote.

Low Pressure Air Test for Storm Sewers Constructed of Non Air-Permeable Materials

When non air-permeable pipe is subjected to a low pressure air test, all of the provisions of Section 7-17.3(2)E shall apply, except that the time in seconds for the pressure drop shall be equal to or greater than four times the time shown in the table listed in Section 7-04.3(1)E.

Low Pressure Air Test for Storm Sewers Constructed of Air-Permeable Materials

When air-permeable pipe is subjected to a low pressure air test, all of the - provisions of Section 7-17.3(2)E shall apply, except that the time in seconds for the pressure drop shall be equal to or greater than the required time as shown in the table below.

Time in Seconds for Pressure Drop

Pipe Dia. (in)	Pipe Length (feet)									
	50	**100**	**150**	**200**	**250**	**300**	**350**	**400**	**450**	**500**
4	5	9	14	18	22	27	31	36	40	45
6	10	20	30	40	50	60	70	80	85	85
8	18	36	54	71	89	107	114	114	114	114
10	28	56	84	111	139	142	142	142	143	159
12	40	80	120	160	170	170	170	183	206	228
15	63	125	188	213	213	214	250	286	320	360
18	90	180	255	255	257	310	360	410	460	520
21	123	245	298	298	350	420	490	560	630	700
24	160	320	340	370	460	550	640	730	830	920
27	203	390	390	460	580	700	810	930	1040	1160
30	250	430	430	570	720	860	1000	1140	1290	1430

All time values listed in the tables are in seconds. If a section to be tested - includes more than one pipe size, the total time required can be found by adding the time values for each size of pipe and its corresponding length. Interpolate between valves for pipe lengths not shown.

Exfiltration Test — Sanitary Sewer

1. Must use clear water.
2. Minimum of 6 feet of water column above crown of pipe.
3. 0.28 gallons per hour, per inch diameter, per 100 feet of pipe tested. See illustration.
4. Not to exceed 16 feet of water column from invert of lower end.
5. Do not enter drainage structure while pipe is full of water.
6. Attach test results with number of feet of completed installation, **actually** tested, to the paynote.

Low Pressure Air Test — Sanitary Sewer

1. The first section of sanitary sewer pipe installed by each crew shall be tested in order to qualify the crew and material.
2. Low pressure air test may be used for air permeable pipes 30 inches in diameter and smaller.
3. Test equipment to be used shall be furnished by the Contractor and shall be inspected and approved by the Engineer prior to use. The Engineer may require a calibration test of gauges.
4. **NO** one shall be permitted to enter a manhole or catch basin when a plugged pipe is under pressure.
5. Pipe over 30 inches in diameter shall be tested one joint at a time.

Measurement

Section 2-09.4 gives limits of structure excavation or trench excavation, which are measured in cubic yards. (Do not include structure excavation paid for 1' outside of manholes, catch basins, grate inlets, and drop inlets.)

Length of sewer pipe is measured from center of manhole to center of manhole or to the inside face of catch basins and similar type structures.

Length of testing sewer pipe is the number of feet of completed installation **- actually** tested between plugs.

Shoring and cribbing is by the square feet measured at the centerline of the trench and at the outer limits of structure excavation. It is measured from original ground to the bottom limits of the structure excavation.

Ditches, Channels, Swales and Ponds

Ditches, swales, ponds and channels tend to fall in two inspection areas, grading and drainage. Generally, the excavation of these areas is inspected by the grading inspector and the drainage structures within these areas are inspected by the drainage inspector. Check with your supervisor to clarify who is the lead in inspecting these items.

Ditches

Per the Talent Decision many ditches are now under the control of the Army Corp of Engineers so make sure to check for permits. If you are required to work on an existing ditch, which is not shown in the Contract Plans, contact your Environmental representative for an evaluation of the ditch.

"Talent Packages" are submitted to the U. S. Army Corp of Engineers for review

Channels

Channels often involve working around existing streams or waterways so outside agency permits may be involved. Make sure you review all permits before starting work.

Ponds

In many Contracts, construction of the permanent detention ponds is a first order of work. Once the ponds are constructed they will be used as Temporary Sediment ponds. It is important to review the location of the permanent detention ponds to make sure they can be used for this function.

Check the Contractor's critical path:

- Has he included the construction of the ponds as the first order of work?
- Where will he be starting his work on the project? Do the locations of the permanent detention ponds make sense for use as Temporary ponds?
- Can water get to the ponds? Are there pipes that must be constructed to carry water to the ponds?
- Temporary detention ponds may have to be constructed throughout the project to handle site runoff.

Excavation

Before excavating the area must be cleared and grubbed.

Details for building these items are generally in the Miscellaneous Details of the Drainage sheets. On larger projects swales and ponds may be detailed on their own plan sheet in the Drainage sheets.

Ponds are generally built using contour grading instead of typical cross sections. Be aware that cut section views are **not** typical cross sections, they are unique to the area where the cut section is drawn.

When the area of the pond has been staked it is a good idea to have your environmental representative review the site to make sure the area will meet the requirements of the permit.

Watch the material being excavated from the pond. An infiltration pond should have sandy, gravelly soil to allow water to infiltrate into the soil. A detention pond should have a solid clay base to prevent infiltration or require the installation of a liner. If the material does not appear to meet the criteria of the pond's function, contact the Designer.

Measurement

Ditch excavation and channel excavation are measured in cubic yards by the neat lines of staked cross sections.

Check the Contract Special Provisions for measurement and payment for ponds and swales.

Part 6

Post Construction

Post Construction

Final Checks

All drainage items installed and marked?

All drainage items clean?

Existing and new drainage items functioning?

Required buy-off from outside agency obtained?

Walk through with maintenance completed?

Complete Documentation

Materials documentation complete

Check the amount of pipe installed and the amount of pipe certified to be sure they match.

Final Paynotes

Are they complete?

Is each drainage structure paid for?

Are test results attached if required?

Are paynotes filled out for deleted drainage structures?

As Constructed Plans

Are these properly revised with exact locations, elevations, and grades shown on the plan and profile sheets?

Are quantities corrected on the Structure Notes plan sheet?

BMPs Removed

Have BMPs been removed and disposed of?

If BMPs must remain until roadside planting is complete have arrangements been made to pay for their removal after close of Contract?

Appendix

Appendix

Related Construction Inspection Classes:

Excavation and Embankment Inspection

Advanced Drainage Inspection

Nuclear Gauge Embankment/Surfacing/Paving Applications

Washington State Department of Transportation

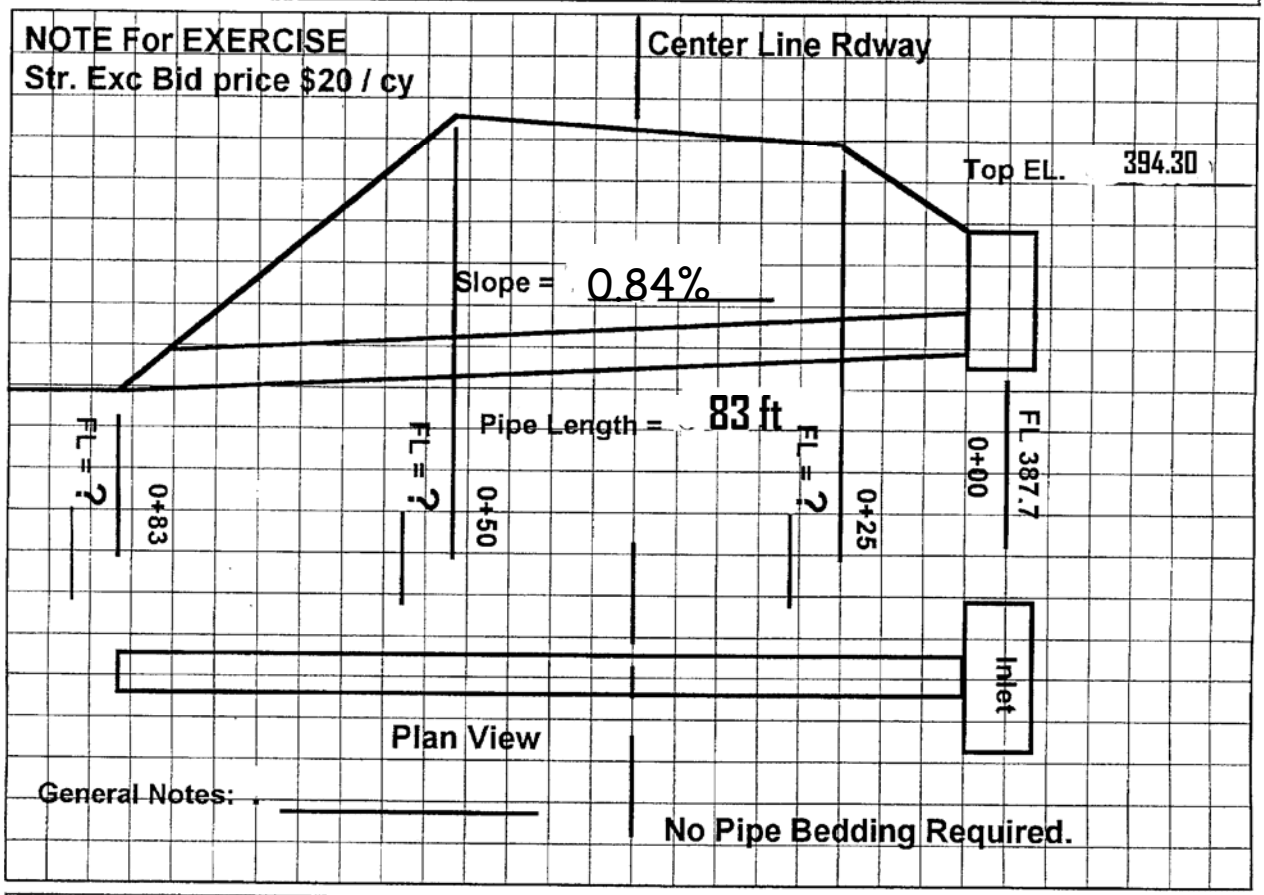
Field Note Record For Drainage

Book No. _____ Page No. _____

Contract No.	Station	Line	C/S	Code Number
2002				D15 - 1

Staked By	Date	Work Started	Work Completed
The "A" Team	April 20, 2001	May 1, 2001	

Calculated By	Date	Checked By	Date	Inspector's Signature	Date



Item No.	Item	Group No.	Date	Unit	Quantity	RAMS No.	Basis of Material Acceptance	CAPS Entry No.	Initials Post	Initials OK	Est. No.
	Grate Inlet Type 2			Ea							
	Sch. A 18" dia. Culv.			LF							
	Plastic Drainage mkrs										

DOT Form 422-637 EF
Revised 9/97

Book No. Revised 9/97 Page No. _____

Structure Excavation

(Pipe Structure Excavation Width =)

Station	Flow Line Grade	Original Ground	Sub-Grade	Centerline Cut		Offset Hub	Offset Cut F.L.	Remarks
				Flow Line	Bottom Ditch			
0+00	387.70	394.3	394.30		8.56			
0 + 2.54		395.01	394.90			15	C 7.86	
0+25		396.4	397.7			15	C 9.15	
0+50		399.01	398.45			15	C 11.25	
0+83		387.00	387.00			15	F 0.22	
Pipe Thickness = 0.164" = 0.01 feet								

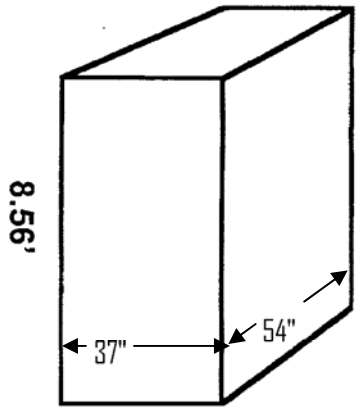
Remarks

Calculations

Sta: Cut Ave Cut x Width x Length / 27 = CY

Str. Exc. Inlet = ? _____

Total Pay Str. Exc = ? _____



Grate Inlet Excavation Limits

DOT Form 422-637 EF
Revised 9/97

Washington State Department of Transportation

Report of Protested Work

Contract Number	Date	Location of Work

Prime Contractor	Subcontractor / Lower Tier Subcontractor	Other

Description of Work Performed and Why Protested

Time Worked Record

	Workers and/or Equipment Working	Occupation of Workers or Equipment Size	Labor		Equipment	
			Regular	Overtime	Operated	Standby
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

This form is for the sole purpose of documenting the use of labor, equipment, and materials on work protested under Section 1-04.5 and 1-09.11 of the Standard Specifications.

Inspector	Contractor's Representative	Title

DOT Form 422-007 EF
Revised 3/98